



LAB N° 1363 L

# EMC TEST REPORT

Test Report No:	21-4789952171-3-1-0-EMC-A
UL Project No:	4789952171
Date of issue:	2021-07-29
Total number of pages:	73
Applicant:	Neri S.p.A. S.S. Emilia, 1622 47020 Longiano (FC) – Italy
Contact's person:	Simone Zoffoli ( <a href="mailto:ZOFFOLI.S@NERI.BIZ">ZOFFOLI.S@NERI.BIZ</a> )
Testing Laboratory:	UL International Italia S.r.l. Via delle Industrie, 6 (Sede A) 20061 Carugate (MI) – Italy
Testing location:	UL International Italia S.r.l. Via delle Industrie, 6 (Sede A) 20061 Carugate (MI) – Italy
Test specification:	
Regulations:	2014/30/EU (EMC)
Standards:	<b>EN IEC 55015:2019+A11:2020</b> <b>EN 61547:2009</b> <b>EN IEC 61000-3-2:2019+A1:2021</b> <b>EN 61000-3-3:2013+A1:2019</b>
Non-standard test method:	N/A
Scope of testing:	EMC - New testing
TRF No.:	TRF_Accredia_RAFI_rev 19.3
Test Report Form(s) Originator:	UL International Italia S.r.l.
Master TRF	2017-07
Compiled by: (name, function, signature)	Francesco Casati Operations Leader 
Approved by: (name, function, signature)	Piergiorgio Riva Laboratory Engineer 
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Description:	Street LED lighting equipment
Trade Mark:	Neri (logo: <b>NERI</b> )
Manufacturer:	Neri S.p.A. S.S. Emilia, 1622 47020 Longiano (FC) – Italy
Model/Type reference:	Nebula L ST Nebula L RGBW
Ratings:	220-240 V~; 50/60 Hz; 44 W ( NEBULA L ST - sample 1 ) 220-240 V~; 50/60 Hz; 40 W ( NEBULA L RGBW - sample 2 )
Testing: ---	
Date of receipt of test item:	2021-05-25
UL Sample Tag No.:	3926246 ( Nebula L ST - sample 1 ) 3926261 ( Nebula L RGBW- sample 2 )
Status of sample upon receipt:	<input checked="" type="checkbox"/> New and operational <input type="checkbox"/> Reconditioned <input type="checkbox"/> Damaged
Date(s) of performance of tests:	2021-07-19 to 2021-07-28
Name and address of factory(ies):	Neri S.p.A. Via delle Querce, 4 47020 Longiano (FC) – Italy
<b>General remarks:</b> A cross <input checked="" type="checkbox"/> in a rectangular shape means that this option is applied. <input checked="" type="checkbox"/> Indicates that the listed condition, standard or equipment is applicable for this report. <input type="checkbox"/> Indicates that the listed condition, standard or equipment is not applicable for this report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as decimal separator.  Where not otherwise specified or communicated in writing, statements of conformity (e.g. Pass/Fail) are established according to the following decision rule: <ul style="list-style-type: none"><li>considering that the applied test standards take measurement uncertainty into account, acceptance limit equals the tolerance limit (Accuracy Method). This leads to a maximum 50% of false accept or false reject when the measured value equals the tolerance limit. See ILAC-G8:09/2019 for further details.</li></ul>	



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**General product information:**

Aluminum tubular projector for outdoor lighting.

SUPPLY VOLTAGE : 220-240V, 50/60Hz

ELECTRICAL INSULATION : Class II

IP66; ta 25 °C





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## 1 Test Item Description

Serial number:	No information available					
Date of production:	No information available					
Ports:	Port name and description	Cable				
		Specified length(m)	Attached during test	Shielded		
	AC Mains	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	DMX signal cable for sample 2 - Nebula L RGBW (only for programming, not tested)	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Supplementary information to the ports:	---					
Rated power supply:		Voltage and frequency	Reference poles			
			N	L1	L2	L3
	<input checked="" type="checkbox"/>	AC: 220-240 V; 50/60 Hz	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	DC:				
Rated power:	44 W ( for sample 1 - NEBULA L ST ) 40 W ( for sample 2 - NEBULA L RGBW )					
Protection class:	II					
Environment of intended use:	<input type="checkbox"/>	Household / Residential				
	<input type="checkbox"/>	Professional / Commercial / Light-industrial				
	<input type="checkbox"/>	Industrial				
	<input type="checkbox"/>	Professional healthcare facility (only for ME)				
	<input type="checkbox"/>	Home healthcare (only for ME)				
	<input type="checkbox"/>	Special (only for ME)				
	<input checked="" type="checkbox"/>	Road and Street				
Working frequencies:	No information available					
Other parameters:	---					
Firmware/Software version:	No information available					
Hardware version:	No information available					
Dimensions in cm (W x H x D):	15.5 x 15.5 x 38.5					
Mounting position:	<input type="checkbox"/>	Table top equipment				
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment				
	<input type="checkbox"/>	Floor standing equipment				
	<input type="checkbox"/>	Hand-held equipment				
	<input type="checkbox"/>	Other:				



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Modules/parts:	Module/parts of test item		Type	Manufacturer
	---		---	---
Operating modes:	No.	Operating mode of test item	Applied for testing	
			Emission	Immunity
	1	On, programmed at maximum luminous intensity (*)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Supplemental information to the operating mode:	(*) Customer's request			
Auxiliary equipment (AuxEq): <i>Peripheral equipment that is part of the system under test</i>	Description	Manufacturer	Type	
	---	---	---	
Associated equipment (AE): <i>Equipment that is not part of the system under test but needed to exercise and/or monitor the EUT</i>	Description	Manufacturer	Type	
	---	---	---	
Documents as provided by the applicant:	Description	File name	Issue date	
	---	---	---	
Modifications to the test item during testing:	None			



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Copy of marking plate:

**Neri Nebula L ST label (sample 1)**



**Neri Nebula L RGBW (sample 2)**





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## 2 Verdict summary section

Requirement – Test case	Reference standard	Accredia Scope	Verdict
Conducted emission	EN IEC 55015:2019 + A11:2020	Yes	P
Radiated emission, magnetic field	EN IEC 55015:2019 + A11:2020	Yes	P
Radiated emission, electric field	EN IEC 55015:2019 + A11:2020	Yes	P
Harmonic current emissions	EN IEC 61000-3-2:2019 + A1:2021	Yes	P
Voltage changes, voltage fluctuations and flicker	EN 61000-3-3:2013 + A1:2019	Yes	N/A <sup>(1)</sup>
Electrostatic discharges	IEC 61000-4-2:2008	Yes <sup>(2)</sup>	P
Radiated, radio-frequency electromagnetic field	IEC 61000-4-3:2006 + A1:2007	Yes <sup>(2)</sup>	P
Electrical fast transients/burst	IEC 61000-4-4:2004	Yes <sup>(2)</sup>	P
Surges	IEC 61000-4-5:2005	Yes <sup>(2)</sup>	P
Conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6:2008	Yes <sup>(2)</sup>	P
Power frequency magnetic fields	IEC 61000-4-8:1993 + A1:2000	Yes <sup>(2)</sup>	P
Voltage dips and short interruptions	IEC 61000-4-11:2004	Yes <sup>(2)</sup>	P
Remarks: 1. The total power of LED lamps is less than 600 W. 2. Test method accredited in the standard EN 61547:2009.			





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### 3 Test Conditions

#### 3.1 Environmental reference conditions

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment.

The climatic conditions during the tests were within the following limits:

Ambient temperature	Relative humidity	Atmospheric pressure
15 °C – 30 °C	30 % – 60 %	860 mbar – 1060 mbar

#### 3.2 Measurement uncertainties

For all measurements where guidance for the calculation of the instrumentation uncertainty of a measurement is specified in CISPR 16-4-2, IEC 61000-4 series or a product standard, the measurement instrumentation uncertainty has been calculated and applied in accordance with these standards.

In all cases if the test laboratory uncertainty is larger than the value for  $U_{\text{CISPR}}$  given in CISPR 16-4-2 the uncertainty are included in the test report annex.

In case the standards in the IEC 61000-4 series or the product standard requires the indication of the uncertainty in the report these uncertainty values are included in the annex.

#### 3.3 Conformity decision rule

##### RF Emissions

☐  $U_{\text{lab}}$  is not taken into account. The compliance is obtained if measured value is less than or equal to the limit

☒ If  $U_{\text{lab}}$  is less than or equal to  $U_{\text{CISPR}}$ , the compliance is obtained if measured value is less than or equal to the limit

☒ If  $U_{\text{lab}}$  exceed  $U_{\text{CISPR}}$ , the compliance is obtained if measured value is less than the limit with a margin of  $U_{\text{lab}} - U_{\text{CISPR}}$

##### Harmonics and Voltage Fluctuations/Flicker Emissions

☒  $U_{\text{lab}}$  is not taken into account. The compliance is obtained if measured value is less than the limit. The instruments software shall indicate "Test PASS".

##### Immunity

☒ The compliance is obtained by criteria A, B or C indicated by the standard (generic) or by the manufacturer (specific). This decision is taken by EMC engineer by visual inspection or other measuring methods of EUT performance.



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### 3.4 Formula used for RF emission quantities

☒ Conducted emission

$$V \text{ (dB}\mu\text{V)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{I.L. transducer (dB)} + \text{I.L. cable (dB)}$$

☐ Magnetic field

$$H \text{ (dB}\mu\text{A/m)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{Magnetic antenna factor (dB}/\Omega\text{m)} + \text{I.L. cables (dB)}$$

☒ Magnetic field induced current

$$I \text{ (dB}\mu\text{A)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{Corrective antenna factor (dB}\Omega^{-1}\text{)}$$

☐ Disturbance power

$$P \text{ (dBpW)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{Clamp factor (dBpW}/\mu\text{V)} + \text{I.L. external 6 dB attenuator (dB)} + \text{I.L. cable (dB)}$$

☒ Radiated emission

$$E \text{ (dB}\mu\text{V/m)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{Electric antenna factor (dB/m)} - \text{Gain external preamplifier (dB)} + \text{I.L. external filter (dB)} + \text{I.L. cables (dB)}$$

Note: external preamplifier and external filter are optional and, if used, are indicated in the list of test equipment

☐ Independent method of measurement of radiated emission (CDNE)

$$V \text{ (dB}\mu\text{V)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{I.L. CDN (dB)} + \text{I.L. external 6dB attenuator (dB)} + \text{I.L. cable (dB)}$$

☐ Radiated power (substitution method)

$$\text{Radiated power (dBm)} = V \text{ receiver (dB}\mu\text{V)} + \text{Correction (dB)}$$

where:

$$\text{Correction (dB)} = \text{Chamber attenuation (dB)} + \text{Gain of calibration transmitting antenna (dBi)} - \text{Gain external preamplifier (dB)} + \text{I.L. external filter (dB)}$$

Note: external preamplifier and external filter are optional and, if used, are indicated in the list of test equipment

$$\text{E (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20 \log D + 104.8; \text{ where D is the measurement distance in meters}$$

$$\text{EIRP (dBm)} = \text{E (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where D is the measurement distance in meters}$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ (dB)}; \text{ where ERP and EIRP are expressed in consistent units}$$

$$\text{EIRP} = \text{ERP} + 2.15 \text{ (dB)}; \text{ ERP and EIRP are expressed in consistent units}$$

☒ Margin

$$\text{Margin (dB)} = \text{Measure} - \text{Limit}$$

☐ Radiated emission limit conversion for a different measuring distance

$$40 \text{ dB/decade (f} < 30 \text{ MHz)}; 20 \text{ dB/decade (f} \geq 30 \text{ MHz)}$$

☐ Linear to logarithmic conversion

$$\text{Log} = 20 * \log(\text{Lin}) \text{ for voltage and current; } \text{Log} = 10 * \log(\text{Lin}) \text{ for power}$$



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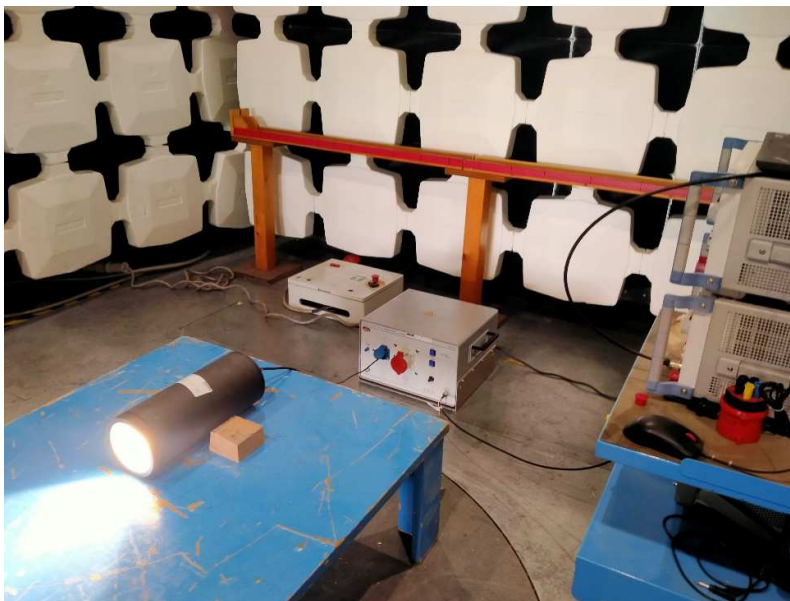
## 4 Emission

### 4.1 Conducted emission

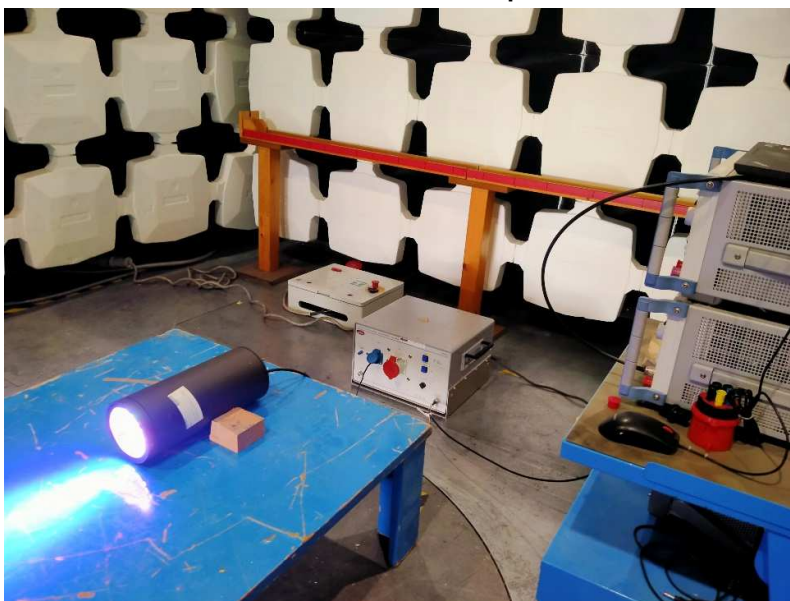
Tested by:	Francesco Casati	
Test date:	2021-07-21	
Test location (stand):	Semi Anechoic Chamber	
Ambient temperature:	27 °C	
Relative humidity:	54 %	
Atmospheric pressure:	994 mbar	
Applied limits:	EN IEC 55015, Table 1	
Test set-up description:	<input type="checkbox"/>	Set-up Type A (40 cm distance to vertical ground plane and 80 cm to horizontal ground plane)
	<input checked="" type="checkbox"/>	Set-up Type B (40 cm distance to horizontal ground plane)
	<input type="checkbox"/>	Floor standing equipment set-up (10 cm over ground plane)
	<input type="checkbox"/>	80 cm to horizontal ground plane (vertical ground plane not used according to ANSI C63.4-2014 clause 5.2.3)
	<input type="checkbox"/>	Artificial hand applied
	<input type="checkbox"/>	Other:
Supplementary test set-up description:	--	
Test method applied:	<input checked="" type="checkbox"/>	Artificial mains network
	<input type="checkbox"/>	Voltage probe
	<input type="checkbox"/>	Current probe
	<input type="checkbox"/>	ISN according to CISPR 32
	<input type="checkbox"/>	In situ CDN (150 Ohm and current probe)
	<input type="checkbox"/>	Current probe and capacitive voltage probe (CVP) according CISPR 32
	<input type="checkbox"/>	CDN according to IEC 61000-4-6
	<input type="checkbox"/>	Artificial mains network used as voltage probe
	<input type="checkbox"/>	Other:
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	--	

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**





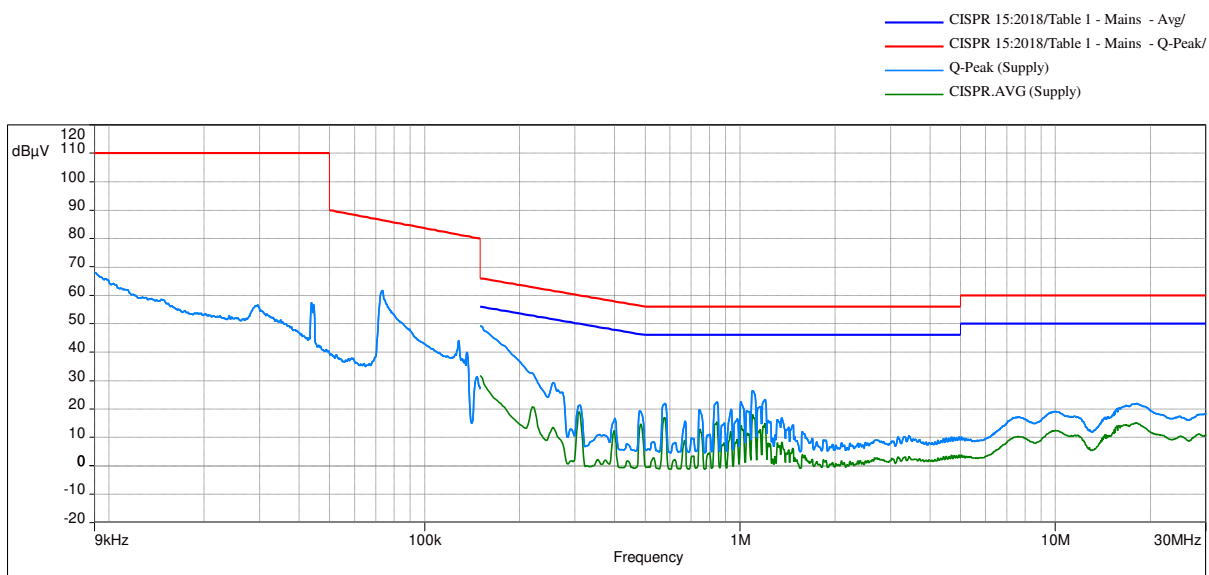
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## Results

<b>Operator:</b>	Francesco Casati		
<b>Model / Configuration:</b>	Nebula L ST - sample 1		
<b>Supply condition:</b>	230V - 50 Hz		
<b>Test Condition:</b>	1		
<b>Port tested:</b>	Ac mains		
<b>Line tested:</b>	Line		
<b>Test result:</b>	Pass	<b>Tested on:</b>	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limits

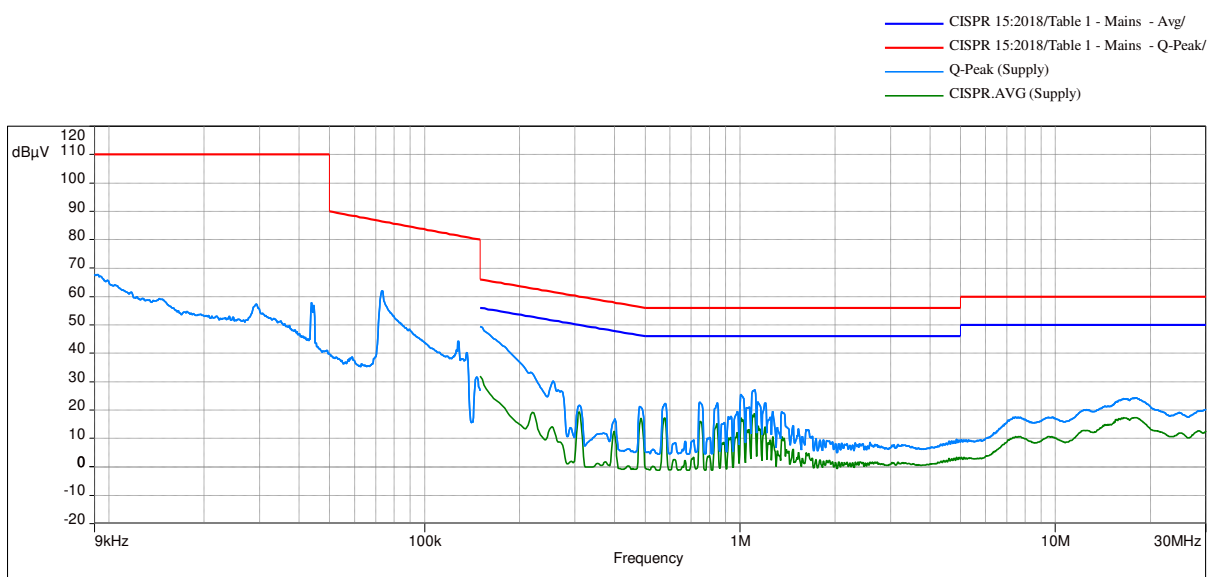


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Operator:	Francesco Casati		
Model / Configuration:	Nebula L ST - sample 1		
Supply condition:	230 V - 50 Hz		
Test Condition:	1		
Port tested:	Ac mains		
Line tested:	Neutral		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limits

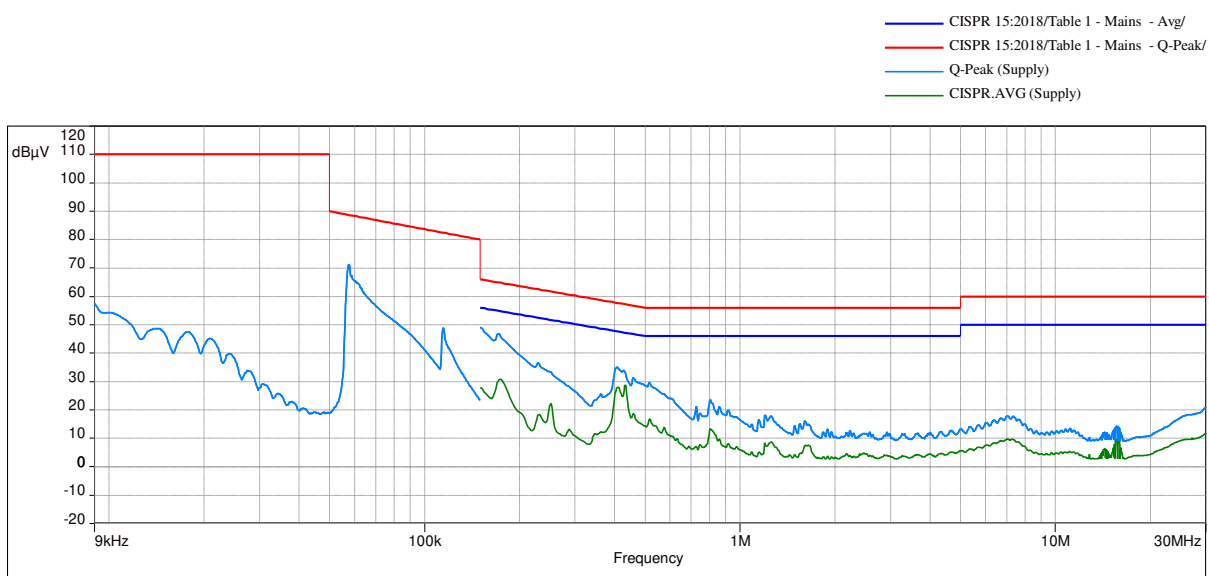


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Operator:	Francesco Casati		
Model / Configuration:	Nebula L RGBW - sample 2		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Port tested:	AC mains		
Line tested:	Neutral		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limits



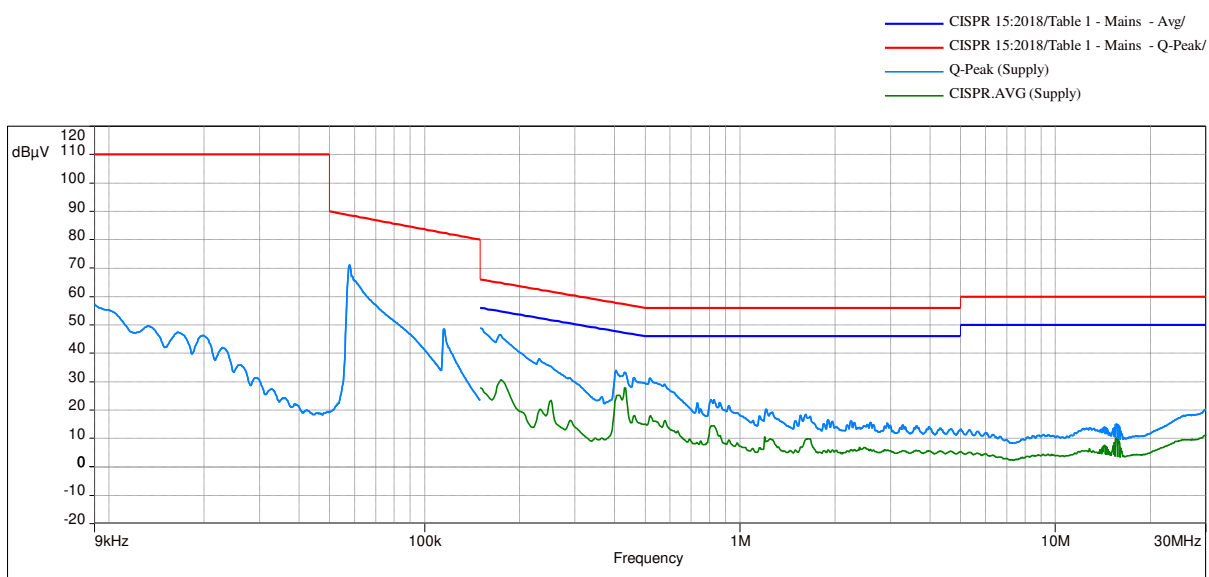


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Operator:	Francesco Casati		
Model / Configuration:	Nebula L RGBW - sample 2		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Port tested:	Ac mains		
Line tested:	Line		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limits





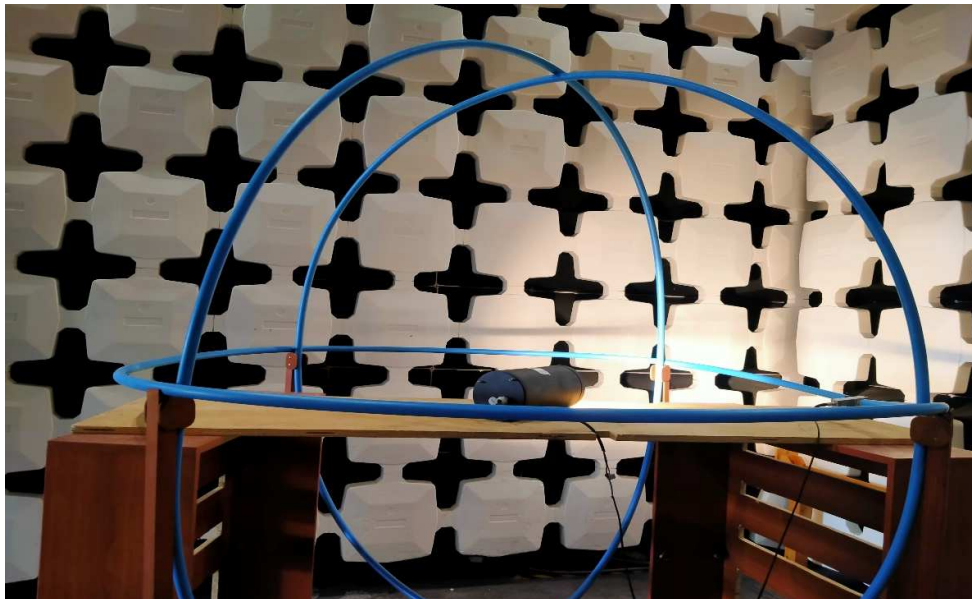
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## 4.2 Radiated emission (magnetic field)

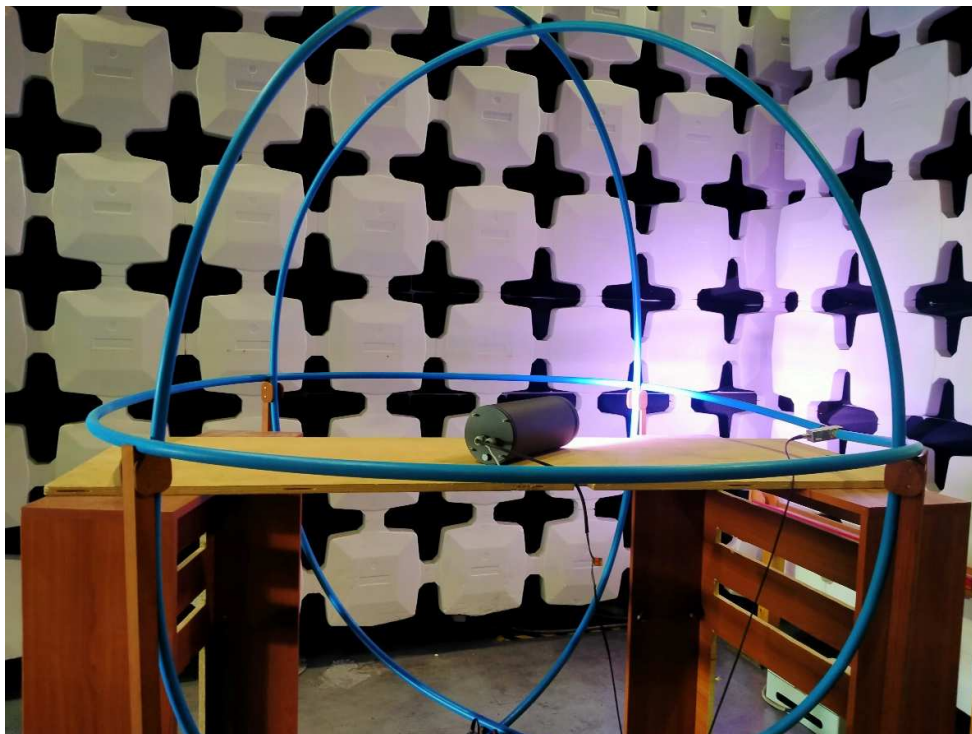
Tested by:	Francesco Casati	
Test date:	2021-07-21	
Test location (stand):	Semi Anechoic Chamber	
Ambient temperature:	27 °C	
Relative humidity:	54 %	
Atmospheric pressure:	994 mbar	
Applied limits:	EN IEC 55015, Table 8	
Test set-up description:	<input type="checkbox"/>	Equipment on a table of 80 cm height
	<input type="checkbox"/>	Equipment on the floor (insulated from ground plane)
	<input checked="" type="checkbox"/>	Equipment placed in the centre of the loop antenna system (LAS) according CISPR 16-2-3
	<input type="checkbox"/>	Other:
Supplementary test set-up description:	---	
Test method:	<input type="checkbox"/>	3 m distance with 0.6 m loop antenna (height: 1.3 m)
	<input checked="" type="checkbox"/>	2 m loop antenna system (LAS) according CISPR 16-2-3
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	---	

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**





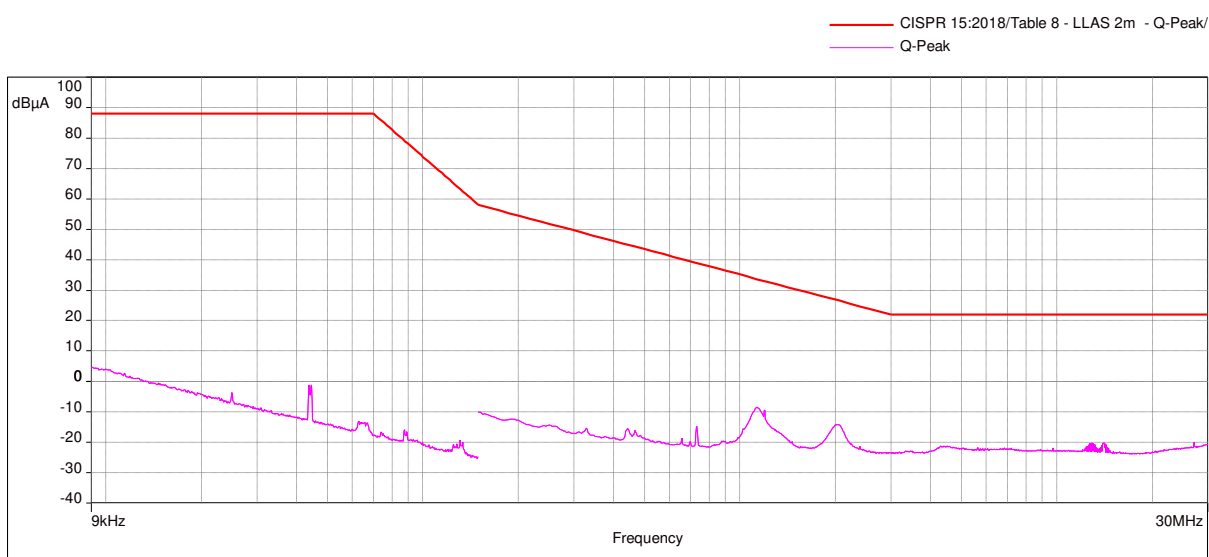
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## Results

<b>Operator:</b>	Francesco Casati		
<b>Model / Configuration:</b>	Nebula L ST - sample 1		
<b>Supply condition:</b>	230 V – 50 Hz		
<b>Test Condition:</b>	1		
<b>Axis:</b>	A (vertical H component)		
<b>Test result:</b>	Pass	<b>Tested on:</b>	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit

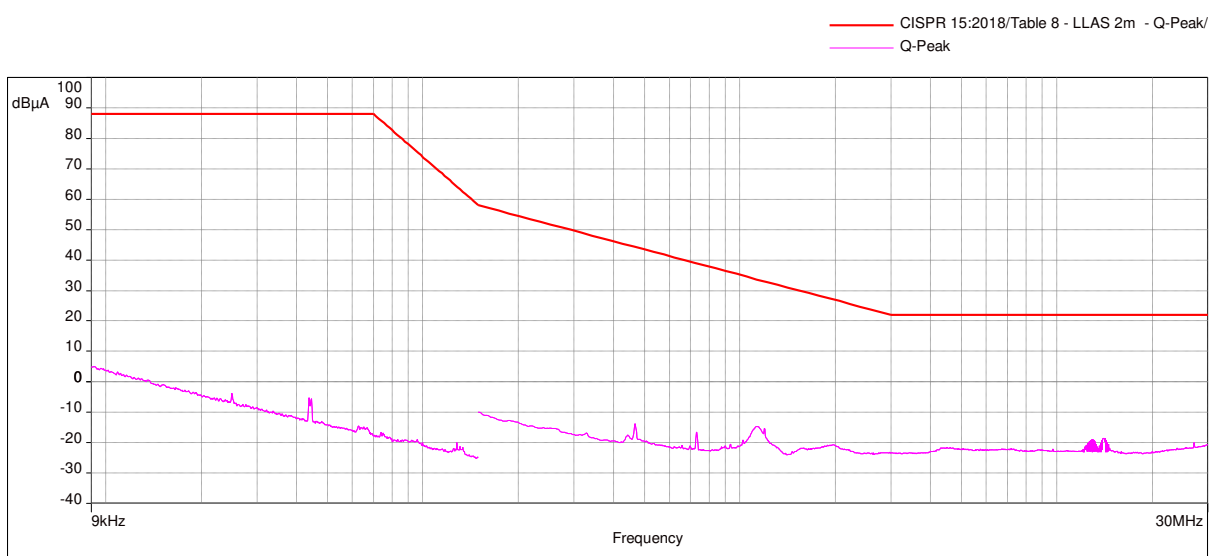


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Operator:	Francesco Casati		
Model / Configuration:	Nebula L ST - sample 1		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Axis:	B (horizontal H component)		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit

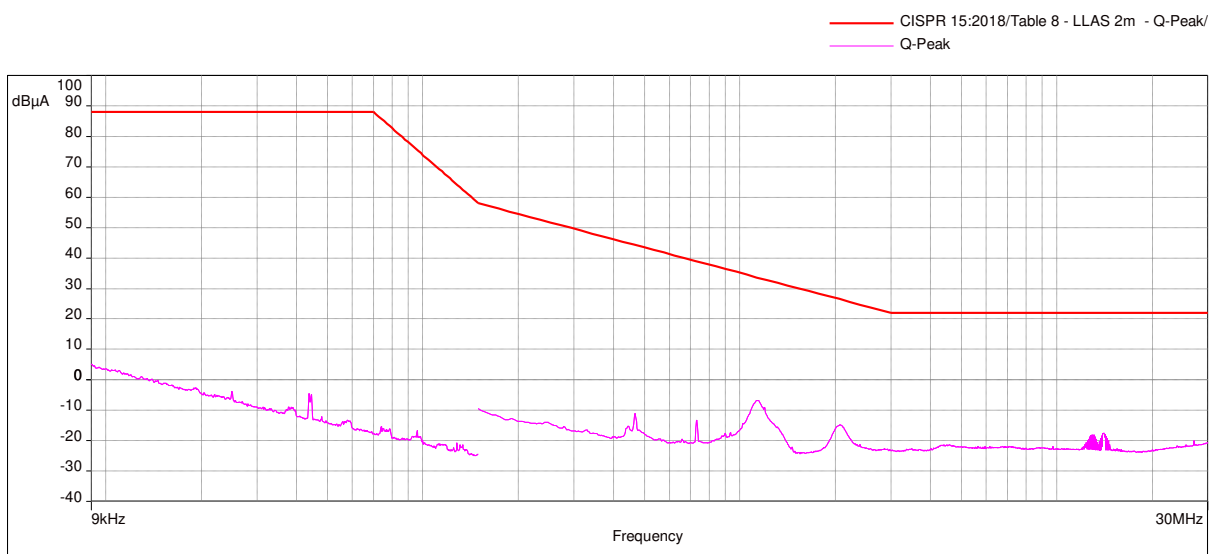


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Operator:	Francesco Casati		
Model / Configuration:	Nebula L ST - sample 1		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Axis:	C (horizontal H component)		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit

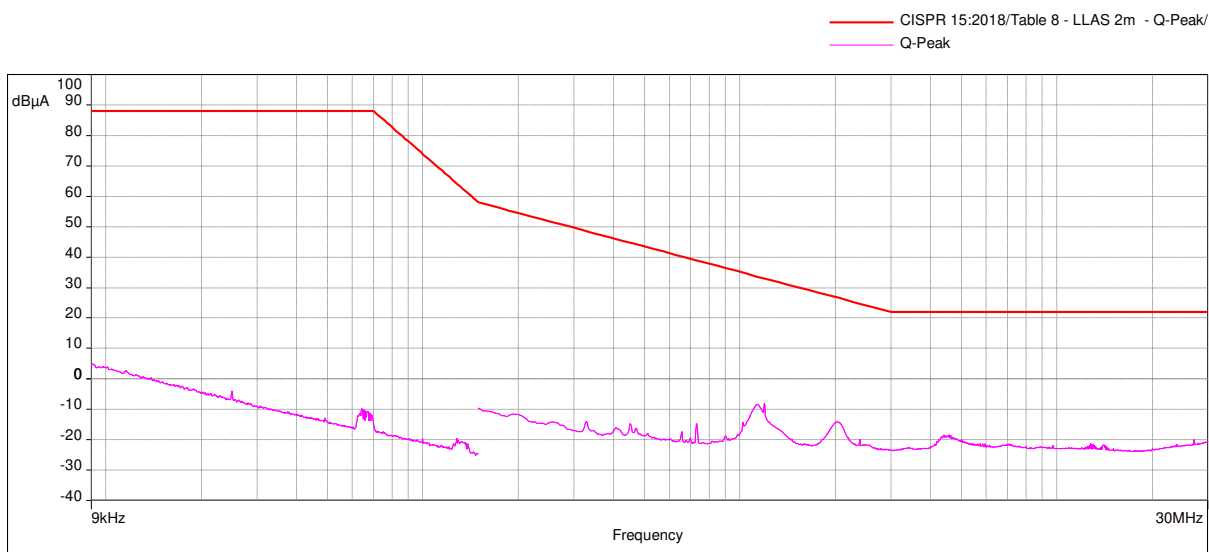


LAB N° 1363 L

Operator:	Francesco Casati		
Model / Configuration:	Nebula L RGBW - sample 2		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Axis:	A (vertical H component)		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit

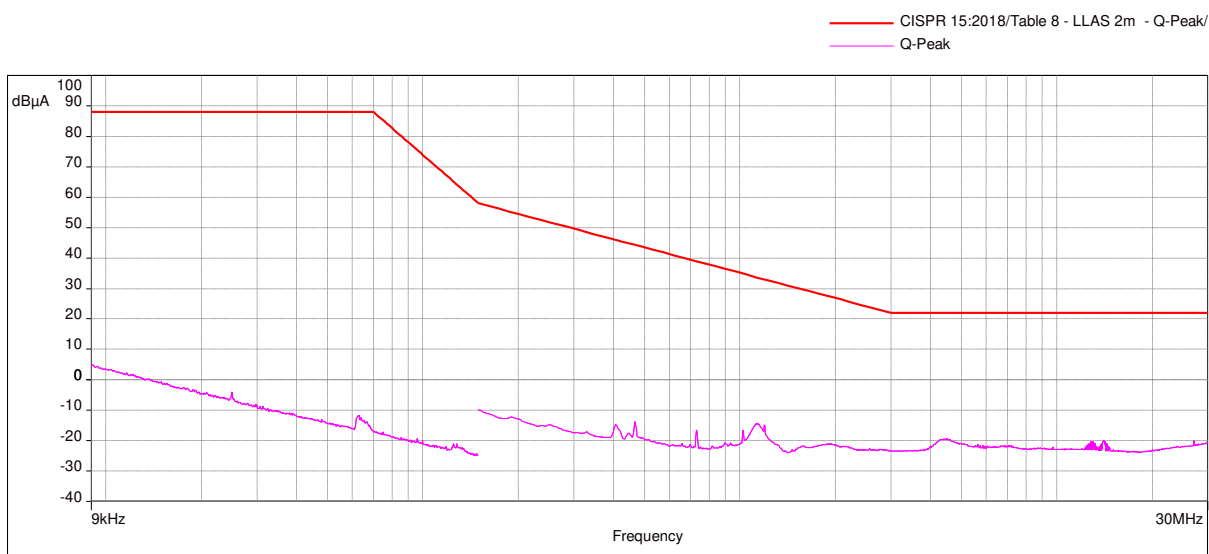


LAB N° 1363 L

Operator:	Francesco Casati		
Model / Configuration:	Nebula L RGBW - sample 2		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Axis:	B (horizontal H component)		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit

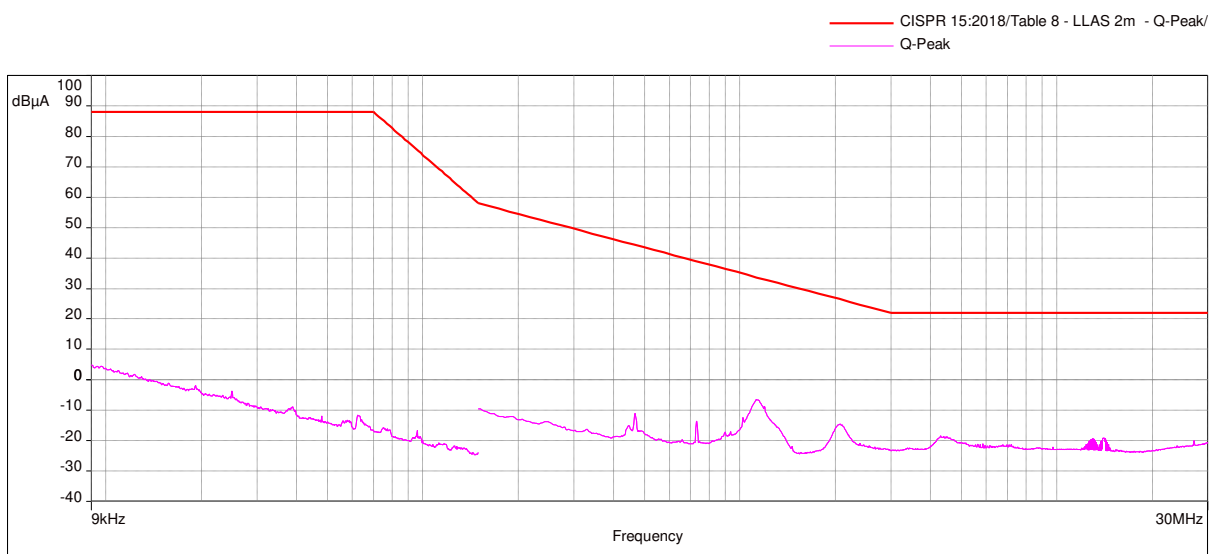


LAB N° 1363 L

Operator:	Francesco Casati		
Model / Configuration:	Nebula L RGBW - sample 2		
Supply condition:	230 V – 50 Hz		
Test Condition:	1		
Axis:	C (horizontal H component)		
Test result:	Pass	Tested on:	2021-07-21

Start Frequency:9kHz; Stop Frequency:150kHz; Step:50Hz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:200Hz; Preamplifier:OFF; Preselector: ON

Start Frequency:150kHz; Stop Frequency:30MHz; Step:2.25kHz; Sweep Time:1000 ms/Step; RF Attenuation:Auto;  
10 dB min attenuation:ON; RBW:9kHz; Preamplifier:OFF; Preselector: ON



No relevant disturbance values have been detected near the limit





LAB N° 1363 L

### 4.3 Radiated emission (electric field)

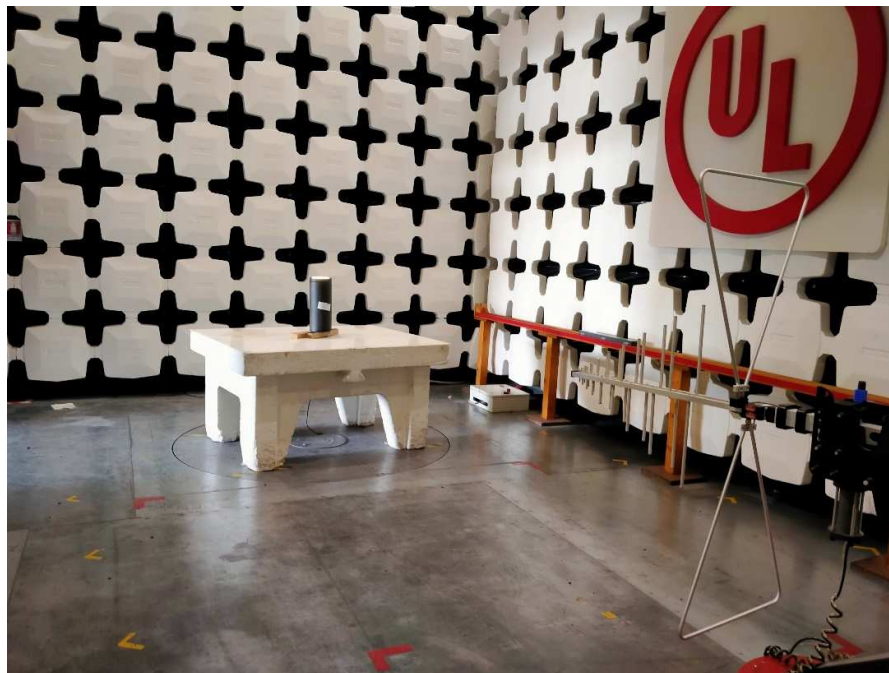
Tested by:	Francesco Casati	
Test date:	2021-07-22	
Test location (stand):	Semi Anechoic Chamber	
Ambient temperature:	27 °C	
Relative humidity:	53 %	
Atmospheric pressure:	995 mbar	
Applied limits:	EN IEC 55015, Table 10	
Test set-up description:	<input checked="" type="checkbox"/>	Equipment on table of 80 cm height
	<input type="checkbox"/>	Equipment on support of 10 cm height
	<input type="checkbox"/>	Equipment on a 10 cm support over the ground plane according CISPR 15 Annex B
	<input type="checkbox"/>	CMAD applied on the following cables:
	<input type="checkbox"/>	CDNE terminated with 50 $\Omega$ on the mains supply cable
	<input type="checkbox"/>	Other:
Supplementary test set-up description:	Pole mounted luminaire CISPR 15 : 2018 Figure C.2 – EUT arrangement of floor - standing and pole-mounted applications during the radiated (OATS, SAC or FAR) disturbance measurements	
Test method:	<input type="checkbox"/>	3 m distance with 0.6 m loop antenna (height: 2 m)
	<input type="checkbox"/>	30 m distance with 0.6 m loop antenna (height: 2 m)
	<input checked="" type="checkbox"/>	OATS or SAC with measurement distance [m]: 3
	<input type="checkbox"/>	FAR CISPR 16-2-3 with measurement distance [m]: 3
	<input type="checkbox"/>	FAR IEC 61000-4-22 with measurement distance [m]: 3
	<input type="checkbox"/>	TEM Waveguide according IEC 61000-4-20
	<input type="checkbox"/>	FSOATS with measurement distance [m]: 3
Boresighting or tilting above 1 GHz:	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Antenna height scanning above 1 GHz:	<input type="checkbox"/>	1 m to 4 m
	<input type="checkbox"/>	Fixed, height [m]:
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	---	



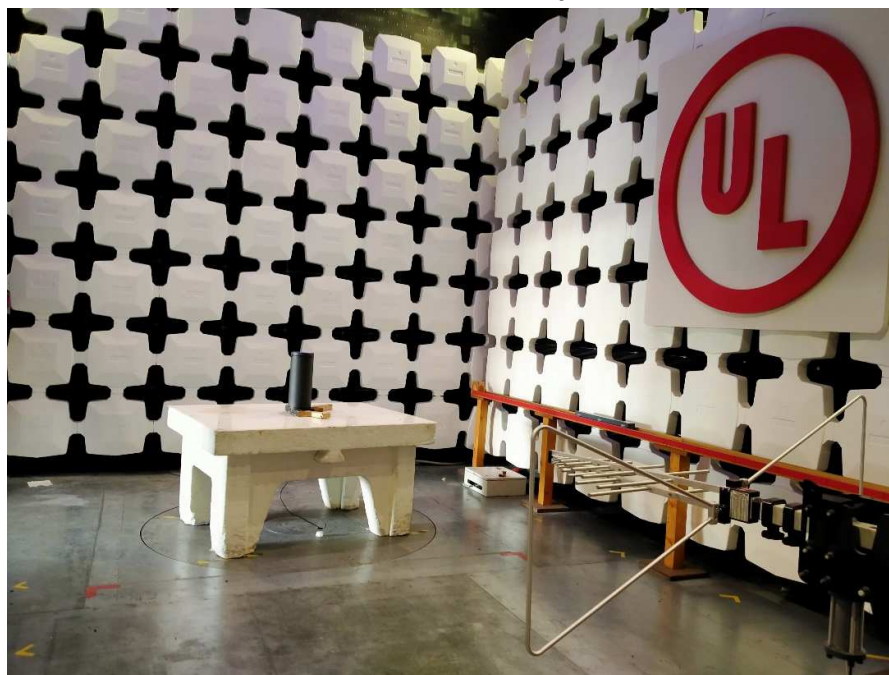
LAB N° 1363 L

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**





LAB N° 1363 L

## Results

<b>Model / Configuration:</b>	Nebula L ST – Sample 1		
<b>Supply condition:</b>	230 V ; 50 Hz		
<b>Test Condition:</b>	1		
<b>Polarization:</b>	horizontal		
<b>Test result:</b>	Pass	<b>Tested on:</b>	2021-07-22

Start Frequency:30MHz; Stop Frequency:1GHz; Step:30kHz; Sweep Time:20 ms/Step; RF Attenuation:Auto;  
RBW:120kHz;VBW:Auto Preamplifier:ON; Preselector:ON

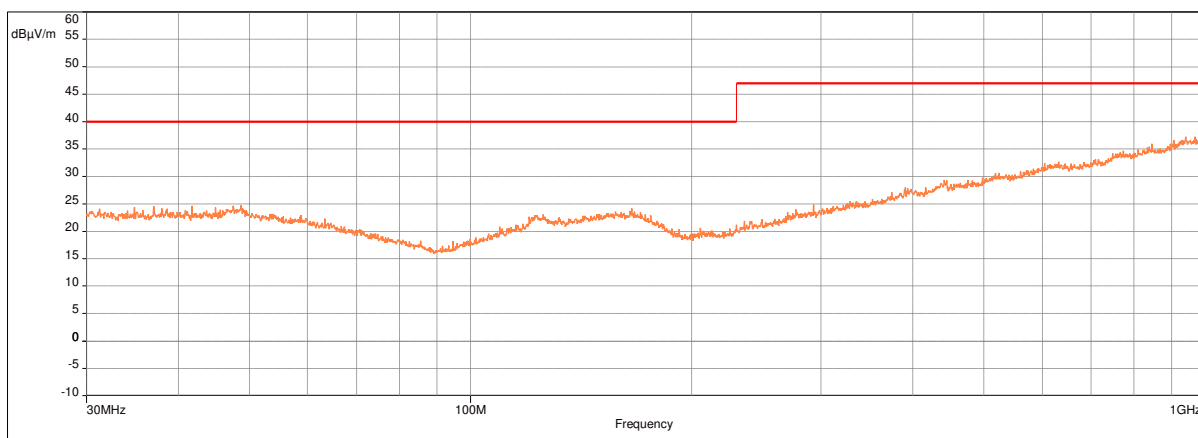
Sub-range 1

Frequencies: 30 MHz - 1 GHz (Mode: - Step: 50 kHz)

Settings: RBW: 120kHz, VBW: Auto, Sweep time: 20 ms/Pts, Attenuation: Auto, Sweep count 1, Preamp: On: 10 dB, LN Preamp: Off, Preselector: On

Polarization:Horizontal

Distance: 3 m



No relevant peaks have been detected near the limit



LAB N° 1363 L

Model / Configuration:	Nebula L ST – Sample 1		
Supply condition:	230 V ; 50 Hz		
Test Condition:	1		
Polarization:	vertical		
Test result:	Pass	Tested on:	2021-07-22

Start Frequency:30MHz; Stop Frequency:1GHz; Step:30kHz; Sweep Time:20 ms/Step; RF Attenuation:Auto;  
RBW:120kHz;VBW:Auto Preamplifier:ON; Preselector:ON

- CISPR 15:2018/Table 10 - Electric field in SAC - Q-Peak/3.0m/
- × Peak (Manual suspects) (Vertical)
- Peak (Vertical)
- × Peak (Peak/Lim.Q-Peak) (Vertical)
- × Measure Peak (Final Measurement Table) (Vertical)
- Measure QPeak (Final Measurement Table) (Vertical)

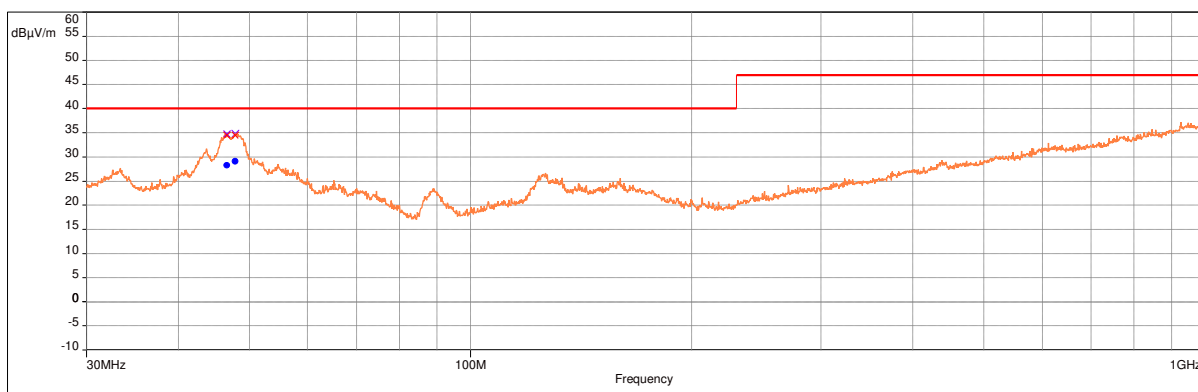
Sub-range 1

Frequencies: 30 MHz - 1 GHz (Mode: - Step: 50 kHz)

Settings: RBW: 120kHz, VBW: Auto, Sweep time: 20 ms/Pts, Attenuation: Auto, Sweep count 1, Preamp: On: 10 dB, LN Preamp: Off, Preselector: On

Polarization: Vertical

Distance: 3 m



Final Measurement Table (2)

Frequen cy (MHz)	SR	Measure Peak (dBμV/m )	Measure QPeak (dBμV/m )	Limit QPeak (dBμV/m )	Margin QPeak (dB)	Max height (m)	Max angle (°)	RBW	Meas.Ti me (s)	Comme nts	Correcti on (dB)
46.6	1	34.44	28.26	40.00	-11.74	1.00	30.00	120k	5	Pass	20.21
47.85	1	34.49	29.06	40.00	-10.94	1.00	270.00	120k	5	Pass	20.23



LAB N° 1363 L

Model / Configuration:	Nebula L RGBW – Sample 2		
Supply condition:	230 V ; 50 Hz		
Test Condition:	1		
Polarization:	horizontal		
Test result:	Pass	Tested on:	2021-07-22

Start Frequency:30MHz; Stop Frequency:1GHz; Step:30kHz; Sweep Time:20 ms/Step; RF Attenuation:Auto;  
RBW:120kHz;VBW:Auto Preamplifier:ON; Preselector:ON

Sub-range 1

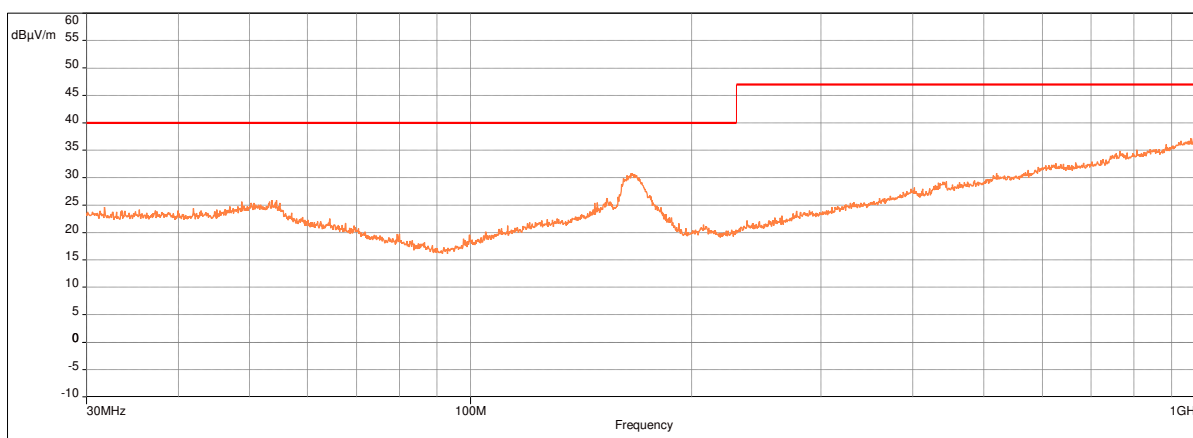
Frequencies: 30 MHz - 1 GHz (Mode: - Step: 50 kHz)

Settings: RBW: 120kHz, VBW: Auto, Sweep time: 20 ms/Pts, Attenuation: Auto, Sweep count 2, Preamp: On: 10 dB, LN Preamp: Off, Preselector: On

Polarization: Horizontal

Distance: 3 m

— CISPR 15:2018/Table 10 - Electric field in SAC - Q-Peak/3.0m/  
— Peak (Horizontal)



No relevant peaks have been detected near the limit



LAB N° 1363 L

Model / Configuration:	Nebula L RGBW – Sample 2		
Supply condition:	230V ; 50 Hz		
Test Condition:	1		
Polarization:	vertical		
Test result:	Pass	Tested on:	2021-07-22

Start Frequency:30MHz; Stop Frequency:1GHz; Step:30kHz; Sweep Time:20 ms/Step; RF Attenuation:Auto;  
RBW:120kHz;VBW:Auto Preamplifier:ON; Preselector:ON

- CISPR 15:2018/Table 10 - Electric field in SAC - Q-Peak/3.0m/
- × Peak (Manual suspects) (Vertical)
- Peak (Vertical)
- × Peak (Peak/Lim.Q-Peak) (Vertical)
- + Measure Peak (Final Measurement Table) (Vertical)
- ◆ Measure QPeak (Final Measurement Table) (Vertical)

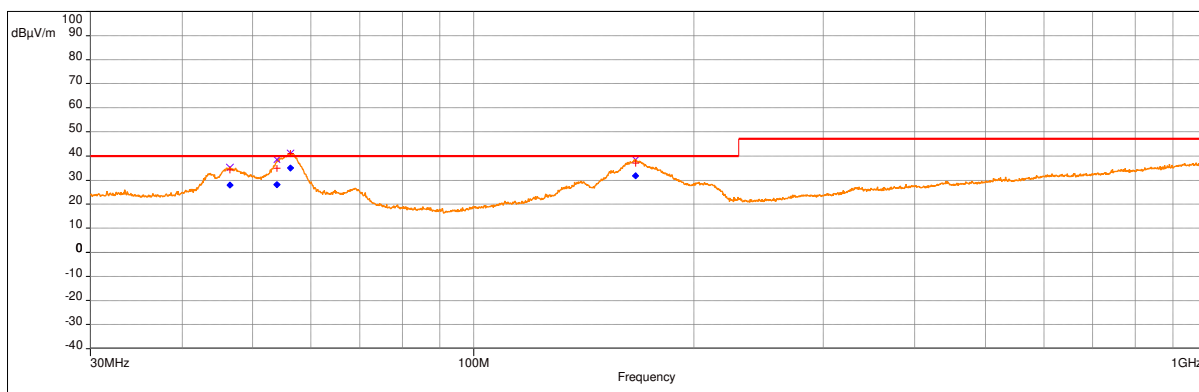
Sub-range 1

Frequencies: 30 MHz - 1 GHz (Mode: - Step: 50 kHz)

Settings: RBW: 120kHz, VBW: Auto, Sweep time: 20 ms/Pts, Attenuation: Auto, Sweep count 2, Preamp: On: 10 dB, LN Preamp: Off, Preselector: On

Polarization: Vertical

Distance: 3 m



Final Measurement Table (4)

Frequen cy (MHz)	SR	Measure Peak (dBμV/m)	Measure QPeak (dBμV/m)	Limit QPeak (dBμV/m)	Margin QPeak (dB)	Max height (m)	Max angle (°)	RBW	Meas.Ti me (s)	Comme nts	Correcti on (dB)
46.55	1	34.39	27.88	40.00	-12.12	1.00	300.00	120k	5	Pass	20.20
53.95	1	34.81	28.01	40.00	-11.99	1.00	330.00	120k	5	Pass	20.09
56.25	1	41.01	35.04	40.00	-4.96	1.00	60.00	120k	5	Pass	19.88
166.35	1	37.11	31.67	40.00	-8.33	1.00	300.00	120k	5	Pass	20.27



LAB N° 1363 L

## 5 Harmonic current emission

Tested by:	Francesco Casati	
Test date:	2021-07-19	
Test location (stand):	EMC Lab	
Ambient temperature:	29 °C	
Relative humidity:	54 %	
Atmospheric pressure:	995 mbar	
Applied standard:	<input checked="" type="checkbox"/>	IEC 61000-3-2
	<input type="checkbox"/>	IEC 61000-3-12
Applied limits:	<input type="checkbox"/>	Class A
	<input type="checkbox"/>	Class B
	<input checked="" type="checkbox"/>	Class C with power > 25 W (Table 2)
	<input type="checkbox"/>	Class C with power $\geq 5$ W and $\leq 25$ W (First dash: Limits of Table 3 column 2)
	<input type="checkbox"/>	Class C with power $\geq 5$ W and $\leq 25$ W (Second dash: 3 <sup>rd</sup> harmonic $\leq 86$ %, 5 <sup>th</sup> harmonic $\leq 61$ % and waveform conditions)
	<input type="checkbox"/>	Class C with power $\geq 5$ W and $\leq 25$ W (Third dash: THD $\leq 70$ %, Harmonics: 3 <sup>rd</sup> $\leq 35$ %, 5 <sup>th</sup> $\leq 25$ %, 7 <sup>th</sup> $\leq 30$ %, 9 <sup>th</sup> and 11 <sup>th</sup> $\leq 20$ %, 2 <sup>nd</sup> $\leq 5$ %)
	<input type="checkbox"/>	Class D
	<input type="checkbox"/>	Non symmetrical equipment (Table 2)
	<input type="checkbox"/>	Symmetrical 3-phase equipment (Table 3)
	<input type="checkbox"/>	Symmetrical 3-phase equipment under special conditions (Table 4)
	<input type="checkbox"/>	Symmetrical 3-phase equipment under special conditions (Table 5)
Observation period:	Description	Period selected $T_{obs}$
	<input checked="" type="checkbox"/> Quasi stationary	$T_{obs} = 2.5$ minutes
	<input type="checkbox"/> Short cyclic	$T_{obs} \geq 10$ cycles =
	<input type="checkbox"/> Random	$T_{obs} =$
	<input type="checkbox"/> Long cyclic	Full program cycle or 2.5 min. with highest THC $T_{obs} =$
Version of measurement instrument standard used IEC 61000-4-7:	<input type="checkbox"/>	IEC 61000-4-7:1991 (Grouping OFF)
	<input checked="" type="checkbox"/>	IEC 61000-4-7:2002 + A1:2008 (Grouping ON)
Control principle used in the sample:	<input checked="" type="checkbox"/>	The EUT <b>does not</b> utilize half-wave rectification or any other method to control the active input power. Such equipment is in conformity with the standard if the measured values comply with the applicable limit.
	<input type="checkbox"/>	The EUT <b>uses</b> half-wave rectification directly on the mains supply, or it uses symmetrical or asymmetrical methods to control the active input power. Such equipment is permitted under conditions only. An evaluation on the control method is required. However, the equipment shall still comply with the harmonic requirements of the standard.
Used mains voltage/frequency:	230 V; 50 Hz	
Supplementary information:	The supply source complies with clause A.2 of IEC 61000-3-2	



Photo of test setup:

**Nebula L ST - Sample 1 :**



**Nebula L RGBW - Sample 2 :**







LAB N° 1363 L

## Results

Operation mode.....		1 – Nebula L ST sample 1									
Port / terminal .....		Ac mains - Line									
Verdict.....		Pass									
Maximum RMS current and corresponding values in timewindow 31:											
Voltage:		230.55 Vrms		THD=0.04 %		THV=0.101 V		POHV=0.025 V		PWHD=0.08 %	
Current:		0.209 Arms		THD=14.16 %		THC=0.029 A		POHC=0.002 A		PWHD=7.68 %	
Power:		46.2 W		P1=46.2 W		48.3 VA					
Power factor:		0.958		CosPhi1: 0.969							
Test conditions: EN IEC 61000-3-2:2019/FprA1:2020, f=50 Hz, Phase=L1, Range=0.80 A											
Time window =10/12 (200ms), Grouping (>2nd harm.)=on, Rated I1=0.207 A											
No Ztest selected											
harmonic cur. < 0.6 % of Ior < 5 mA are NOT DISREGARD for calc. of THD, THC, POHC, PWHD											
HARMONIC ANALYSIS: Test PASS											
Tobs = entire measurement; POHC (C.2): avg=0.00 A, limit=0.02 A											
lavg=0.208 Arms											
Ha	Entire measurement (2.5 min = 750 time windows)					Worst 2.5 min		Average		P A S S	F A I L
	Maximum	Window	EN61000-3-2 Class C>25W	Margin in MaxWin	100 to 150%	Ex- ceeded	100 to 150%	Ex- ceeded	Value		
DC	-0.0120 A	140	-----	-----	0	0	n.e.	n.e.	-0.0119 A	0	--
1	0.2070 A	3	-----	-----	0	0	n.e.	n.e.	0.2058 A	0	X
2	0.0005 A	742	0.0041 A	-87.9 %	0	0	n.e.	n.e.	0.0004 A	0	X
3	0.0231 A	478	0.0559 A	-58.7 %	0	0	n.e.	n.e.	0.0227 A	0	X
4	0.0002 A	326	-----	-----	0	0	n.e.	n.e.	0.0002 A	0	X
5	0.0148 A	31	0.0207 A	-28.7 %	0	0	n.e.	n.e.	0.0146 A	0	X
6	0.0002 A	547	-----	-----	0	0	n.e.	n.e.	0.0002 A	0	X
7	0.0090 A	196	0.0145 A	-37.8 %	0	0	n.e.	n.e.	0.0090 A	0	X
8	0.0002 A	478	-----	-----	0	0	n.e.	n.e.	0.0002 A	0	X
9	0.0051 A	6	0.0104 A	-50.6 %	0	0	n.e.	n.e.	0.0049 A	0	X
10	0.0002 A	2	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
11	0.0019 A	215	0.0062 A	-68.9 %	0	0	n.e.	n.e.	0.0019 A	0	X
12	0.0002 A	38	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
13	0.0008 A	620	0.0062 A	-87.3 %	0	0	n.e.	n.e.	0.0007 A	0	X
14	0.0002 A	327	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
15	0.0014 A	521	0.0062 A	-77.8 %	0	0	n.e.	n.e.	0.0013 A	0	X
16	0.0002 A	136	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
17	0.0017 A	4	0.0062 A	-72.5 %	0	0	n.e.	n.e.	0.0017 A	0	X
18	0.0002 A	212	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
19	0.0017 A	586	0.0062 A	-72.9 %	0	0	n.e.	n.e.	0.0016 A	0	X
20	0.0002 A	203	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
21	0.0010 A	1	0.0062 A	-84.0 %	0	0	n.e.	n.e.	0.0009 A	0	X
22	0.0002 A	483	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
23	0.0006 A	111	0.0062 A	-90.3 %	0	0	n.e.	n.e.	0.0006 A	0	X
24	0.0002 A	111	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
25	0.0005 A	738	0.0062 A	-91.4 %	0	0	n.e.	n.e.	0.0005 A	0	X
26	0.0002 A	703	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
27	0.0008 A	247	0.0062 A	-87.8 %	0	0	n.e.	n.e.	0.0007 A	0	X
28	0.0002 A	696	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
29	0.0008 A	180	0.0062 A	-86.5 %	0	0	n.e.	n.e.	0.0008 A	0	X
30	0.0002 A	211	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
31	0.0007 A	7	0.0062 A	-88.0 %	0	0	n.e.	n.e.	0.0007 A	0	X
32	0.0002 A	473	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
33	0.0006 A	1	0.0062 A	-91.1 %	0	0	n.e.	n.e.	0.0005 A	0	X
34	0.0002 A	210	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
35	0.0004 A	234	0.0062 A	-93.2 %	0	0	n.e.	n.e.	0.0004 A	0	X
36	0.0002 A	719	-----	-----	0	0	n.e.	n.e.	0.0002 A	0	X
37	0.0005 A	305	0.0062 A	-91.5 %	0	0	n.e.	n.e.	0.0005 A	0	X
38	0.0002 A	1	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
39	0.0006 A	1	0.0062 A	-89.8 %	0	0	n.e.	n.e.	0.0006 A	0	X
40	0.0002 A	1	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
average value < 0.6 % of Iavg or < 5 mA n.e. = not evaluated											
Tested with SPS BMC 4.50 / NON/Elby Spitznberger & Splies GmbH & Co. KG, Schmidstr. 32-34, 94234 Viechtach, Germany, 19.07.2021											



LAB N° 1363 L

Operation mode.....: 1 – Nebula L RGBW sample 2											
Port / terminal.....: Ac mains - Line											
Verdict.....: Pass											
Maximum RMS current and corresponding values in timewindow 32:											
Voltage:	230.56 Vrms	THD=0.04 %	THV=0.099 V	POHV=0.025 V	PWHD=0.08 %						
Current:	0.194 Arms	THD=11.44 %	THC=0.022 A	POHC=0.002 A	PWHD=7.80 %						
Power:	43.2 W	P1=43.2 W	44.6 VA								
Power factor:	0.967	CosPhi1: 0.975									
Test conditions: EN IEC 61000-3-2:2019/FprA1:2020, f=50 Hz, Phase=L1, Range=0.80 A											
Time window =10/12 (200ms), Grouping (>2nd harm.)=on, Rated I1=0.192 A											
No Ztest selected											
harmonic cur. < 0.6 % of Ior < 5 mA are NOT DISREGARD for calc. of THD, THC, POHC, PWHD											
HARMONIC ANALYSIS: Test PASS											
Tobs = entire measurement; POHC (C.2): avg=0.00 A, limit=0.02 A											
Iavg=0.193 Arms											
Ha	Entire measurement (2.5 min = 750 time windows)					Worst 2.5 min		Average		P A S S	F A I L
	Maximum	Window	EN61000-3-2 Class C>25W	Margin in MaxWin	100 to 150%	Ex- ceeded	100 to 150%	Ex- ceeded	Value		
DC	-0.0120 A	234	-----	-----	0	0	n.e.	n.e.	-0.0119 A	0	--
1	0.1919 A	32	-----	-----	0	0	n.e.	n.e.	0.1911 A	0	X
2	0.0003 A	548	0.0038 A	-91.9 %	0	0	n.e.	n.e.	0.0002 A	0	X
3	0.0216 A	101	0.0518 A	-58.2 %	0	0	n.e.	n.e.	0.0212 A	0	X
4	0.0001 A	294	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
5	0.0042 A	70	0.0192 A	-78.0 %	0	0	n.e.	n.e.	0.0040 A	0	X
6	0.0001 A	383	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
7	0.0007 A	42	0.0134 A	-95.0 %	0	0	n.e.	n.e.	0.0006 A	0	X
8	0.0001 A	289	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
9	0.0003 A	724	0.0096 A	-96.6 %	0	0	n.e.	n.e.	0.0003 A	0	X
10	0.0001 A	134	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
11	0.0006 A	703	0.0058 A	-90.0 %	0	0	n.e.	n.e.	0.0005 A	0	X
12	0.0000 A	390	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
13	0.0005 A	54	0.0058 A	-90.6 %	0	0	n.e.	n.e.	0.0005 A	0	X
14	0.0001 A	97	-----	-----	0	0	n.e.	n.e.	0.0001 A	0	X
15	0.0010 A	51	0.0058 A	-82.1 %	0	0	n.e.	n.e.	0.0010 A	0	X
16	0.0001 A	314	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
17	0.0010 A	94	0.0058 A	-83.1 %	0	0	n.e.	n.e.	0.0009 A	0	X
18	0.0001 A	118	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
19	0.0011 A	1	0.0058 A	-81.1 %	0	0	n.e.	n.e.	0.0011 A	0	X
20	0.0000 A	152	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
21	0.0009 A	90	0.0058 A	-84.8 %	0	0	n.e.	n.e.	0.0009 A	0	X
22	0.0000 A	41	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
23	0.0009 A	716	0.0058 A	-83.9 %	0	0	n.e.	n.e.	0.0009 A	0	X
24	0.0000 A	308	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
25	0.0008 A	746	0.0058 A	-86.8 %	0	0	n.e.	n.e.	0.0007 A	0	X
26	0.0000 A	15	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
27	0.0009 A	721	0.0058 A	-84.5 %	0	0	n.e.	n.e.	0.0009 A	0	X
28	0.0000 A	495	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
29	0.0008 A	722	0.0058 A	-85.4 %	0	0	n.e.	n.e.	0.0008 A	0	X
30	0.0000 A	460	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
31	0.0008 A	689	0.0058 A	-85.4 %	0	0	n.e.	n.e.	0.0008 A	0	X
32	0.0000 A	447	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
33	0.0008 A	748	0.0058 A	-86.6 %	0	0	n.e.	n.e.	0.0008 A	0	X
34	0.0000 A	220	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
35	0.0007 A	748	0.0058 A	-87.1 %	0	0	n.e.	n.e.	0.0007 A	0	X
36	0.0000 A	36	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
37	0.0007 A	750	0.0058 A	-88.4 %	0	0	n.e.	n.e.	0.0007 A	0	X
38	0.0000 A	27	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
39	0.0006 A	187	0.0058 A	-89.4 %	0	0	n.e.	n.e.	0.0006 A	0	X
40	0.0000 A	34	-----	-----	0	0	n.e.	n.e.	0.0000 A	0	X
average value < 0.6 % of Iavg or < 5 mA n.e. = not evaluated											
Tested with SPS EMC 4.5.0 / NON Eby Spitzenberger & Spiess GmbH & Co. KG, Schmidstr. 32-34, 94234 Viechtach, Germany, 1907/2021											



LAB N° 1363 L

## 6 Immunity

### 6.1 General Information

Performance criteria as defined by the standard		
Criterion	Description from standard	
A	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.	
B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however no change of actual operating state or stored data is allowed to persist after the test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.	
C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.	
Other:	--	
NOTE 1:	Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.	
NOTE 2:	A change of luminous intensity may be checked by visual observation but, in case of doubt, the following applies. The luminous intensity of a luminaire or of the lamp(s) shall be measured by means of a illuminance (lux) meter which is positioned in an axis perpendicular to the main plane of the luminaire or lamp(s), in its centre and at a distance for proper operation of the lux meter. The luminous intensity shall be deemed to be unchanged if the measured intensities do not deviate by more than 15 %.	
Performance criteria details		
Criterion	Description	Monitoring
A	Not specified by the customer. Generic criteria used	<ul style="list-style-type: none"><li>• Visual inspection of EUT</li><li>• Montoring of current absorption.</li></ul>
B	Not specified by the customer. Generic criteria used	
C	Not specified by the customer. Generic criteria used	
Supplementary information:		
---		



LAB N° 1363 L

## 6.2 Electrostatic discharge

Tested by:	Francesco Casati	
Test date:	2021-07-20	
Test location (stand):	EMC Lab	
Ambient temperature:	27 °C	
Relative humidity:	50 %	
Atmospheric pressure:	996 mbar	
Applied test level:	<input checked="" type="checkbox"/>	Contact: 4 kV
	<input checked="" type="checkbox"/>	Air: 8 kV
	<input type="checkbox"/>	Other:
Test set-up:	<input type="checkbox"/>	Table top equipment
	<input type="checkbox"/>	Floor standing equipment
	<input checked="" type="checkbox"/>	Wall or ceiling mounted equipment (Treated as table top)
Supplementary test set-up description:	---	
Size of horizontal coupling plate:	1.6 x 0.8 m	
Size of vertical coupling plate:	0.5 x 0.5 m	
Number of discharges for each test point:	20 (10 positive and 10 negative)	
Discharge interval:	1 s	
Performance criterion:	B	
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	--	

Photo of test setup:

**Nebula L ST - Sample 1 :**



**Nebula L RGBW - Sample 2 :**

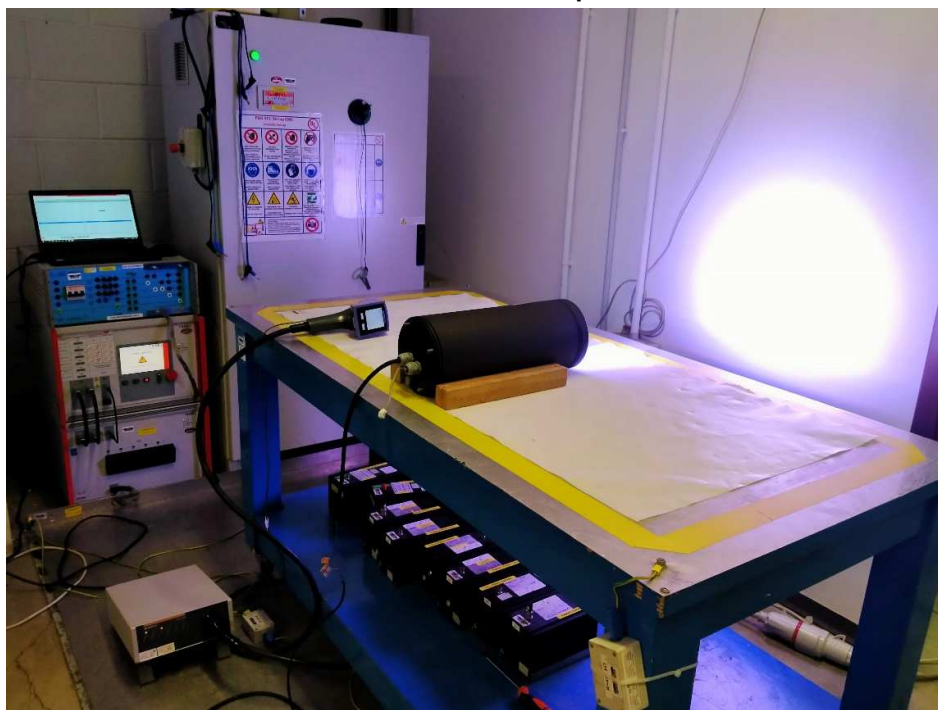




Photo of selected test points:

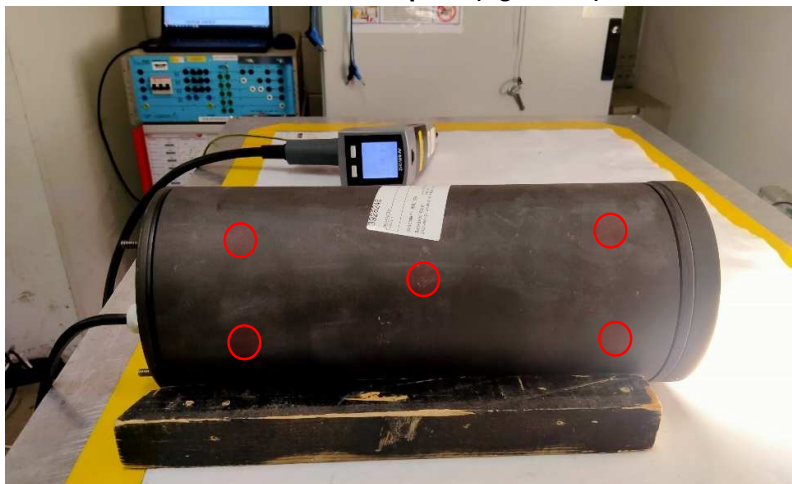
Nebula L ST - Sample 1 (front side) :



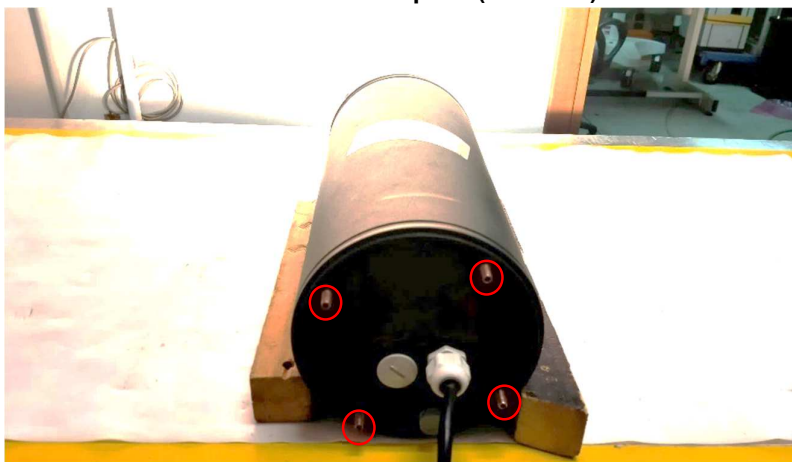
Nebula L ST - Sample 1 (left side) :



Nebula L ST - Sample 1 (right side) :



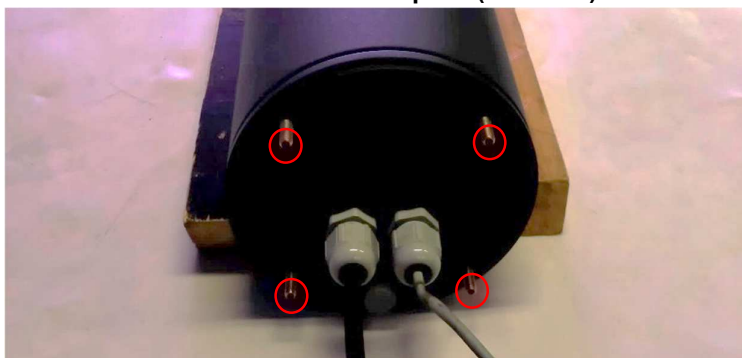
**Nebula L ST - Sample 1 (rear side) :**



**Nebula L RGBW - Sample 2 (front) :**



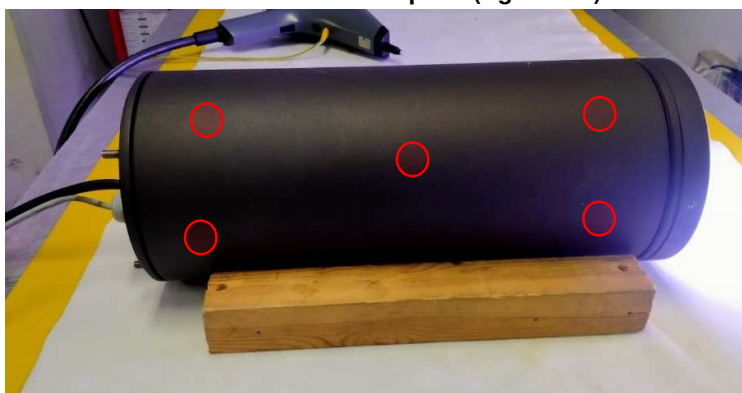
**Nebula L RGBW - Sample 2 (rear side) :**





**Nebula L RGBW - Sample 2 (left side) :**



**Nebula L RGBW - Sample 2 (right side) :**



 : contact discharge

 : air discharge





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**Test results for Nebula L ST - sample 1**

No.	Location of discharge	Polarity	Discharge	Number of discharges	Test level [kV]	Operating mode	Observations
1	HCP left side	P	C	10	4	1	B1
2	HCP left side	N	C	10	4	1	B1
3	HCP right side	P	C	10	4	1	B1
4	HCP right side	N	C	10	4	1	B1
5	HCP front side	P	C	10	4	1	B1
6	HCP front side	N	C	10	4	1	B1
7	VCP right side	P	C	10	4	1	A1
8	VCP right side	N	C	10	4	1	A1
9	VCP left side	P	C	10	4	1	A1
10	VCP left side	N	C	10	4	1	A1
11	VCP front side	P	C	10	4	1	A1
12	VCP front side	N	C	10	4	1	A1
13	VCP rear side	P	C	10	4	1	A1
14	VCP rear side	N	C	10	4	1	A1
15	Points on conductive surface as indicated in the picture above	P	C	10	4	1	B1
16	Points on conductive surface as indicated in the picture above	N	C	10	4	1	B1
17	Points on non-conductive surface as indicated in the picture above	P	A	10	8	1	A1
18	Points on non-conductive surface as indicated in the picture above	N	A	10	8	1	A1
Lower test levels .....:		<input checked="" type="checkbox"/>	Tested				
		<input type="checkbox"/>	Not tested				
HCP = Horizontal coupling plate VCP = Vertical coupling plate			P = Positive N = Negative		A = Air discharge C = Contact discharge		
Supplementary information: A1: Pass. No observed response / malfunction from EUT during and after the test B1 : Temporary variation on lamp brightness with self recovery to initial condition.							



LAB N° 1363 L

**Test results for Nebula L RGBW - sample 2**

No.	Location of discharge	Polarity	Discharge	Number of discharges	Test level [kV]	Operating mode	Observations
1	HCP left side	P	C	10	4	1	A1
2	HCP left side	N	C	10	4	1	A1
3	HCP right side	P	C	10	4	1	A1
4	HCP right side	N	C	10	4	1	A1
5	HCP bottom side	P	C	10	4	1	A1
6	HCP bottom side	N	C	10	4	1	A1
7	VCP right side	P	C	10	4	1	A1
8	VCP right side	N	C	10	4	1	A1
9	VCP left side	P	C	10	4	1	A1
10	VCP left side	N	C	10	4	1	A1
11	VCP front side	P	C	10	4	1	A1
12	VCP front side	N	C	10	4	1	A1
13	VCP rear side	P	C	10	4	1	A1
14	VCP rear side	N	C	10	4	1	A1
15	Points on conductive surface as indicated in the picture above	P	C	10	4	1	A1
16	Points on conductive surface as indicated in the picture above	N	C	10	4	1	A1
17	Points on non-conductive surface as indicated in the picture above	P	A	10	8	1	A1
18	Points on non-conductive surface as indicated in the picture above	N	A	10	8	1	A1
Lower test levels .....		<input checked="" type="checkbox"/>	Tested				
		<input type="checkbox"/>	Not tested				
HCP = Horizontal coupling plate		P = Positive		A = Air discharge			
VCP = Vertical coupling plate		N = Negative		C = Contact discharge			
Supplementary information:							
A1: Pass. No observed response / malfunction from EUT during and after the test							



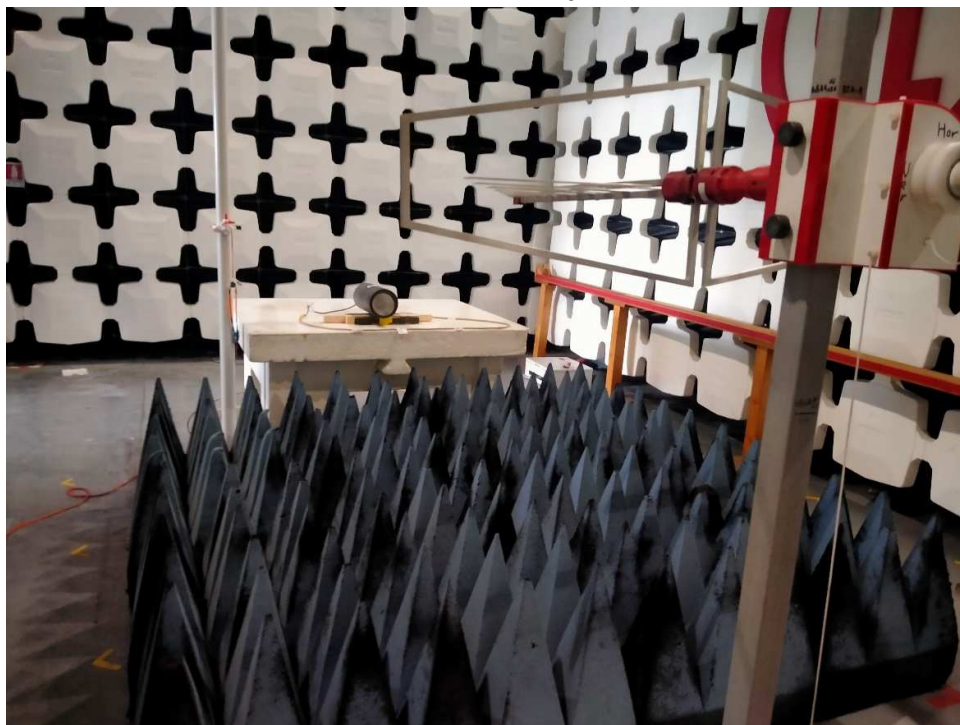
LAB N° 1363 L

### 6.3 Radiated, radio-frequency electromagnetic field

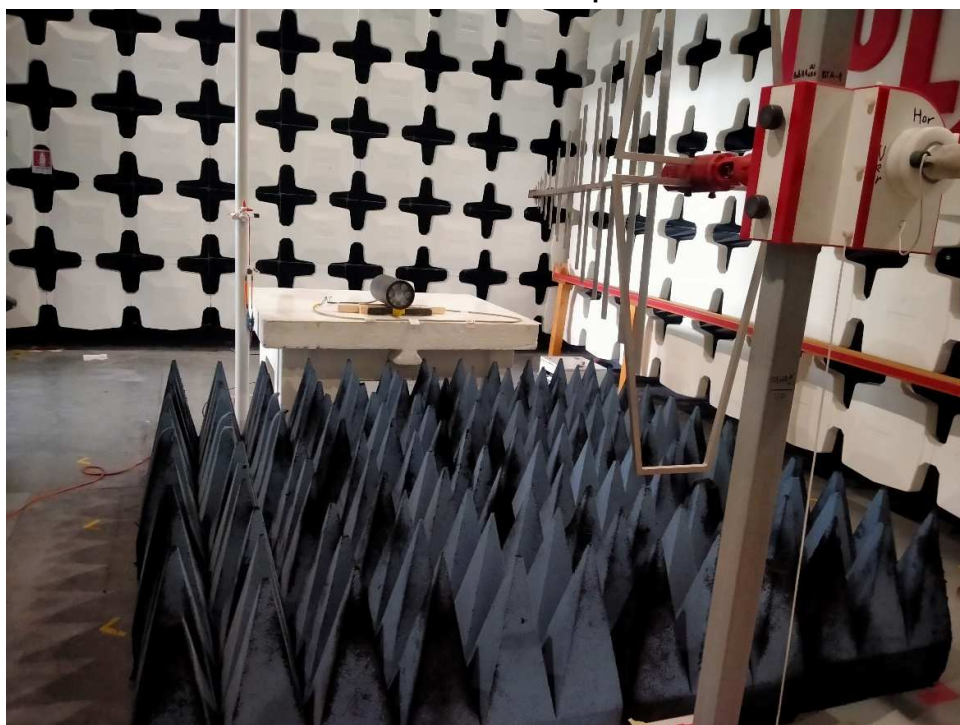
Tested by:	Francesco Casati	
Test date:	2021-07-23	
Test location (stand):	Semi Anechoic Chamber	
Ambient temperature:	29 °C	
Relative humidity:	52 %	
Atmospheric pressure:	1002 mbar	
Applied test level:	<input type="checkbox"/>	1 V/m
	<input checked="" type="checkbox"/>	3 V/m
	<input type="checkbox"/>	10 V/m
	<input type="checkbox"/>	Other:
Test set-up:	<input checked="" type="checkbox"/>	Equipment on the table (0.8 m height)
	<input type="checkbox"/>	Equipment standing on floor (0.05 – 0.15 m height)
Supplementary test set up description:	---	
Exposed side of EUT:	<input checked="" type="checkbox"/>	0° (Front)
	<input checked="" type="checkbox"/>	90 °
	<input checked="" type="checkbox"/>	180 ° (Rear)
	<input checked="" type="checkbox"/>	270 °
	<input checked="" type="checkbox"/>	Top side
	<input checked="" type="checkbox"/>	Bottom side
Reason for not exposing a side:	---	
Distance Antenna to EUT:	2 m	
Test method:	<input checked="" type="checkbox"/>	IEC 61000-4-3 (FAR)
	<input type="checkbox"/>	IEC 61000-4-22 (FAR, uniform set-up)
	<input type="checkbox"/>	IEC 61000-4-20 (TEM)
Step size:	1 %	
Performance criterion:	A	
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	--	

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**





LAB N° 1363 L

**Test results Nebula L ST – Sample 1**

Frequency range	Test Level [V/m]	Polarization	Modulation	Operation mode	Dwell time [s]	Observations
80-1000 MHz	3	H	80 % AM, 1 kHz	1	3	A1
80-1000 MHz	3	V	80 % AM, 1 kHz	1	3	A1

H = Horizontal

V = Vertical

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test

**Test results Nebula L RGBW – Sample 2**

Frequency range	Test Level [V/m]	Polarization	Modulation	Operation mode	Dwell time [s]	Observations
80-1000 MHz	3	H	80 % AM, 1 kHz	1	3	A1
80-1000 MHz	3	V	80 % AM, 1 kHz	1	3	A1

H = Horizontal

V = Vertical

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test



LAB N° 1363 L

#### 6.4 Electrical fast transients/burst

Tested by:	Francesco Casati	
Test date:	2021-07-20	
Test location (stand):	EMC Lab	
Ambient temperature:	27 °C	
Relative humidity:	50 %	
Atmospheric pressure:	996 mbar	
Applied test level:	<input type="checkbox"/>	Signal/control ports: 0.5 kV
	<input type="checkbox"/>	Input and output DC power ports: 0.5 kV
	<input checked="" type="checkbox"/>	Input and output AC power ports: 1 kV
	<input type="checkbox"/>	Other:
Test set-up:	<input type="checkbox"/>	Equipment on the table ( $0.1 \pm 0.01$ ) m above ground plane
	<input checked="" type="checkbox"/>	Equipment standing on floor at ( $0.1 \pm 0.01$ ) m above ground plane
	<input type="checkbox"/>	Artificial hand applied. Location see photo.
Supplementary test set-up description:	---	
Repetition frequency:	<input type="checkbox"/>	2.5 kHz
	<input checked="" type="checkbox"/>	5 kHz
	<input type="checkbox"/>	100 kHz
	<input type="checkbox"/>	Other:
Test time:	<input type="checkbox"/>	1 minute for each polarity
	<input checked="" type="checkbox"/>	2 minute for each polarity
	<input type="checkbox"/>	Other:
Performance criterion:	B	
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	--	



Photo of test setup:

**Nebula L ST - Sample 1 :**



**Nebula L RGBW - Sample 2 :**





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**Table: Test results for Nebula L ST - sample 1**

Port	Coupling	Level [kV]	Polarity	Test frequency [kHz]	Operating mode	Observation
AC Mains	CDN	1	P	5	1	A1
AC Mains	CDN	1	N	5	1	A1
CDN = Coupling/Decoupling Network D = Direct Coupling CCC = Capacitive Coupling Clamp						
P = Positive N = Negative						
Supplementary information: A1: Pass. No observed response / malfunction from EUT during and after the test						

**Table: Test results for Nebula L RGBW - sample 2**

Port	Coupling	Level [kV]	Polarity	Test frequency [kHz]	Operating mode	Observation
AC Mains	CDN	1	P	5	1	A1
AC Mains	CDN	1	N	5	1	A1
CDN = Coupling/Decoupling Network D = Direct Coupling CCC = Capacitive Coupling Clamp						
P = Positive N = Negative						
Supplementary information: A1: Pass. No observed response / malfunction from EUT during and after the test						





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## 6.5 Surges

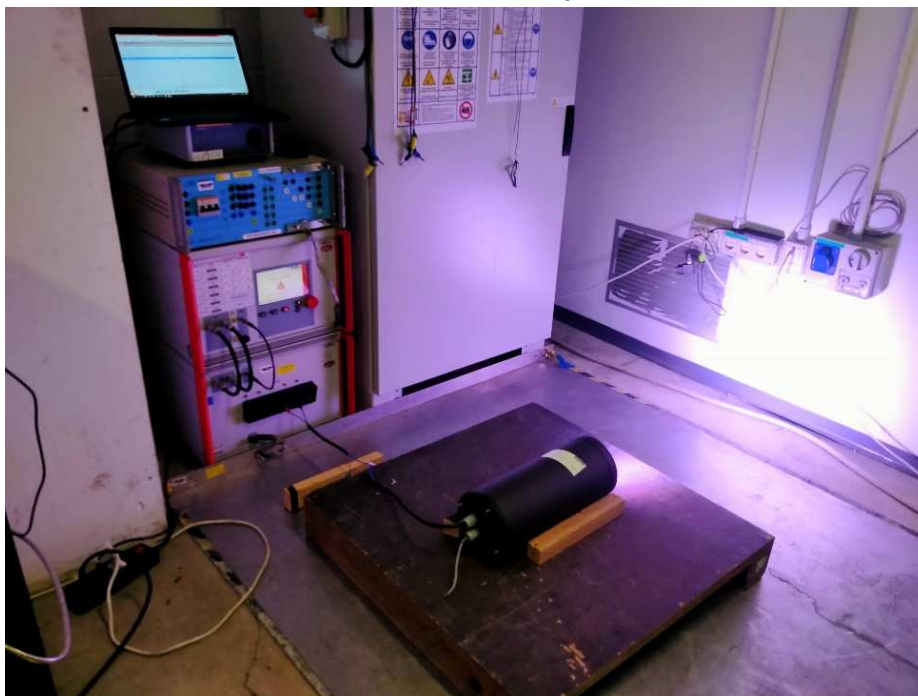
Tested by:	Francesco Casati	
Test date:	2021-07-20	
Test location (stand):	EMC Lab	
Ambient temperature :	27 °C	
Relative humidity:	50 %	
Atmospheric pressure:	996 mbar	
Applied test level:	<input type="checkbox"/>	Signal/control ports: 1 kV (DM) or N/A
	<input type="checkbox"/>	Input and output DC power ports: 0.5 kV (DM); 1 kV (CM) or N/A
	<input type="checkbox"/>	Input and output AC power ports: 0.5 kV (DM); 1 kV (CM)
	<input checked="" type="checkbox"/>	Input and output AC power ports: 1 kV (DM); 2 kV (CM)
	<input type="checkbox"/>	Other:
Test set-up description:	<input type="checkbox"/>	Equipment on a support (0.1 ± 0.01) m above ground plane
	<input checked="" type="checkbox"/>	Ground plane not applicable
Repetition rate:	60 s	
Number of pulses for each coupling:	10 (5 positive and 5 negative)	
Performance criterion:	C	
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	---	

Photo of test setup:

**Nebula L ST - Sample 1 :**



**Nebula L RGBW - Sample 2 :**





LAB N° 1363 L

**Table: Test results of Nebula L ST - sample 1**

Port	Coupling	Application points	Level [kV]	Polarity	Phase angles [°]	Operating mode	Observation
AC Mains	MCN	N → L	1	P	90	1	A1
AC Mains	MCN	N → L	1	N	270	1	A1
AC Mains	MCN	PE → N	2	P	90	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → N	2	N	270	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → L	2	P	90	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → L	2	N	270	---	N/A <sup>(1)</sup>
Lower test levels .....		<input checked="" type="checkbox"/>	Tested				
		<input type="checkbox"/>	Not tested				
P = Positive N = Negative			MCN = Mains Coupling Network ICN = Coupling Network for interconnection lines D = Direct Coupling (shielded lines)				
Supplementary information: A1: Pass. No observed response / malfunction from EUT during and after the test 1 : The E.U.T is protection class II, without PE.							

**Table: Test results of Nebula L RGBW - sample 2**

Port	Coupling	Application points	Level [kV]	Polarity	Phase angles [° ]	Operating mode	Observation
AC Mains	MCN	N → L	1	P	90	1	A1
AC Mains	MCN	N → L	1	N	270	1	A1
AC Mains	MCN	PE → N	2	P	90	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → N	2	N	270	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → L	2	P	90	---	N/A <sup>(1)</sup>
AC Mains	MCN	PE → L	2	N	270	---	N/A <sup>(1)</sup>
Lower test levels .....:		<input checked="" type="checkbox"/>	Tested				
		<input type="checkbox"/>	Not tested				
P = Positive N = Negative			MCN = Mains Coupling Network ICN = Coupling Network for interconnection lines D = Direct Coupling (shielded lines)				
Supplementary information: A1: Pass. No observed response / malfunction from EUT during and after the test 1 : The E.U.T is protection class II, without PE.							



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## 6.6 Conducted disturbances, induced by radio-frequency fields

Tested by:	Francesco Casati	
Test date:	2021-07-20	
Test location (stand):	EMC Lab	
Ambient temperature:	27 °C	
Relative humidity:	50 %	
Atmospheric pressure:	996 mbar	
Applied test level:	<input type="checkbox"/>	Signal/control ports: 3 V
	<input type="checkbox"/>	Input and output DC power ports: 3 V
	<input checked="" type="checkbox"/>	Input and output AC power ports: 3 V
	<input type="checkbox"/>	Other:
Test set-up:	<input checked="" type="checkbox"/>	Equipment located ( $0.1 \pm 0.05$ ) m above ground plane
	<input type="checkbox"/>	Elevated ground plane according to Annex F
	<input type="checkbox"/>	Artificial hand applied. Location see photo.
	<input type="checkbox"/>	Other:
Supplementary test set-up description:	--	
Modulation:	<input checked="" type="checkbox"/>	80 % AM with 1 kHz
	<input type="checkbox"/>	80 % AM with 2 Hz
	<input type="checkbox"/>	Other:
Step size:	1 %	
Performance criterion:	A	
Used mains voltage/frequency:	230 V ; 50 Hz	
Supplementary information:	--	

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**







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**Test results for Nebula L ST - sample 1**

Frequency range	Test Level [V]	Port under test	Coupling device	Port with terminated CDN	Operating mode	Dwell time [s]	Observations
150 kHz ÷ 80 MHz	3	Ac mains	CDN M2	None	1	2	A1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test

**Test results for Nebula L RGBW - sample 2**

Frequency range	Test Level [V]	Port under test	Coupling device	Port with terminated CDN	Operating mode	Dwell time [s]	Observations
150 kHz ÷ 80 MHz	3	Ac mains	CDN M2	None	1	2	A1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test



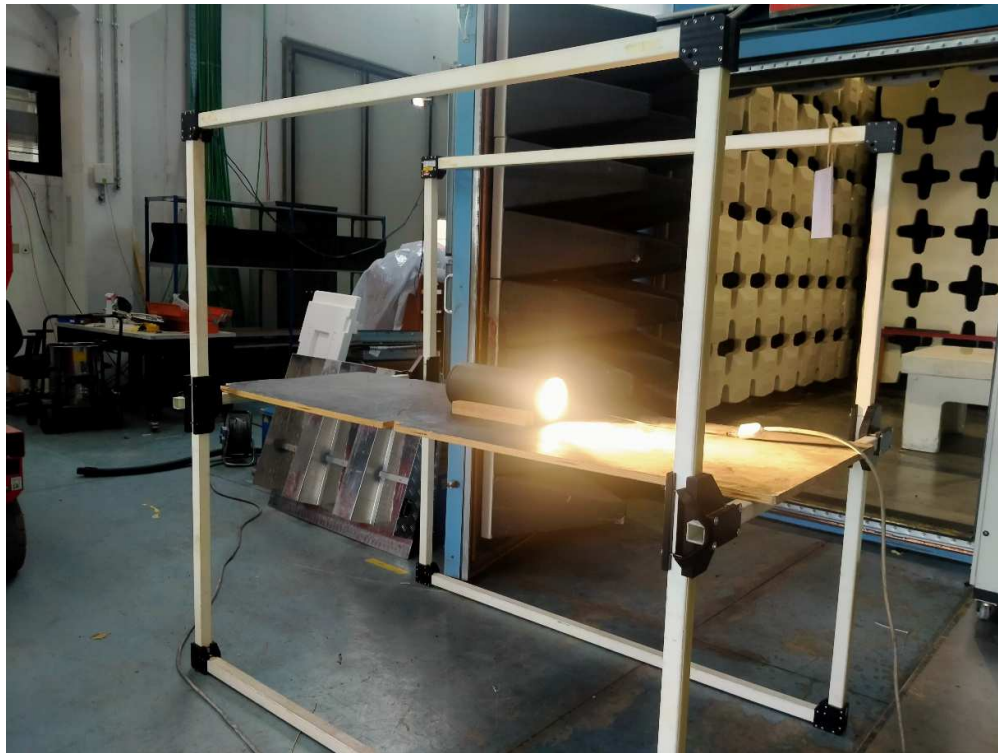
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## 6.7 Power frequency magnetic fields

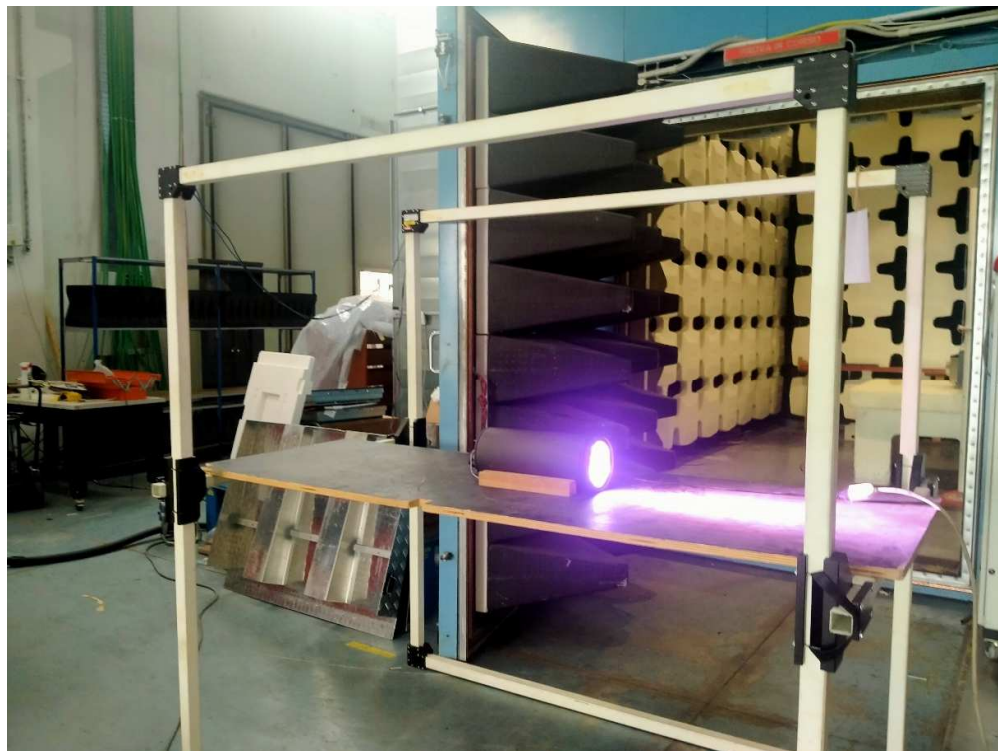
Tested by:	Francesco Casati		
Test date:	2021-07-28		
Test location (stand):	EMC Lab		
Ambient temperature:	29 °C		
Relative humidity:	51 %		
Atmospheric pressure:	995 mbar		
Applied test level:	Continuous field		Short duration: 1 s to 3 s
	<input type="checkbox"/>	1 A/m	<input type="checkbox"/> 300 A/m
	<input checked="" type="checkbox"/>	3 A/m	<input type="checkbox"/> 1000 A/m
	<input type="checkbox"/>	10 A/m	<input type="checkbox"/> Other:
	<input type="checkbox"/>	30 A/m	
	<input type="checkbox"/>	100 A/m	
	<input type="checkbox"/>	Other:	
Test set-up:	<input type="checkbox"/>	0.1 m above metal surface	
	<input checked="" type="checkbox"/>	Homogeneous field (Helmholtz coil). Dimensions: 1.8 x 1.8 m	
	<input type="checkbox"/>	Single Coil. Dimensions: 1 x 1 m	
	<input type="checkbox"/>	Single Coil. Dimensions: 1 x 2.6 m	
Performance criterion:	A		
Reason for not performing the test:	<input type="checkbox"/>	The equipment contains no components which are susceptible to power frequency magnetic fields.	
	<input type="checkbox"/>	Other:	
Used mains voltage/frequency:	230 V; 50/60 Hz		
Supplementary information:	--		

Photo of test setup:

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**







LAB N° 1363 L

**Test results for Nebula L ST – sample 1**

Test frequency [Hz]	Test Level [A/m]	Test time [s]	Coil size/type [m]	Axis	Operating mode	Mains voltage/frequency	Observations
50	3	60	1.8 X 1.8	X	1	230 V; 50 Hz	A1
50	3	60	1.8 X 1.8	Y	1	230 V; 50 Hz	A1
50	3	60	1.8 X 1.8	Z	1	230 V; 50 Hz	A1
60	3	60	1.8 X 1.8	X	1	230 V; 60 Hz	A1
60	3	60	1.8 X 1.8	Y	1	230 V; 60 Hz	A1
60	3	60	1.8 X 1.8	Z	1	230 V; 60 Hz	A1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test

**Test results for Nebula L RGBW - sample 2**

Test frequency [Hz]	Test Level [A/m]	Test time [s]	Coil size/type [m]	Axis	Operating mode	Mains voltage/frequency	Observations
50	3	60	1.8 X 1.8	X	1	230 V; 50 Hz	A1
50	3	60	1.8 X 1.8	Y	1	230 V; 50 Hz	A1
50	3	60	1.8 X 1.8	Z	1	230 V; 50 Hz	A1
60	3	60	1.8 X 1.8	X	1	230 V; 60 Hz	A1
60	3	60	1.8 X 1.8	Y	1	230 V; 60 Hz	A1
60	3	60	1.8 X 1.8	Z	1	230 V; 60 Hz	A1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test



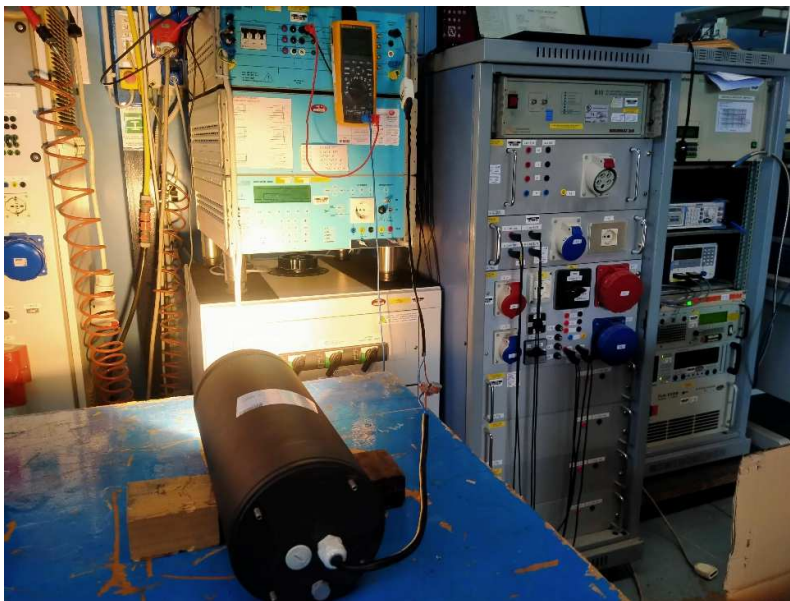
LAB N° 1363 L

## 6.8 Voltage dips, short interruptions and voltage variations

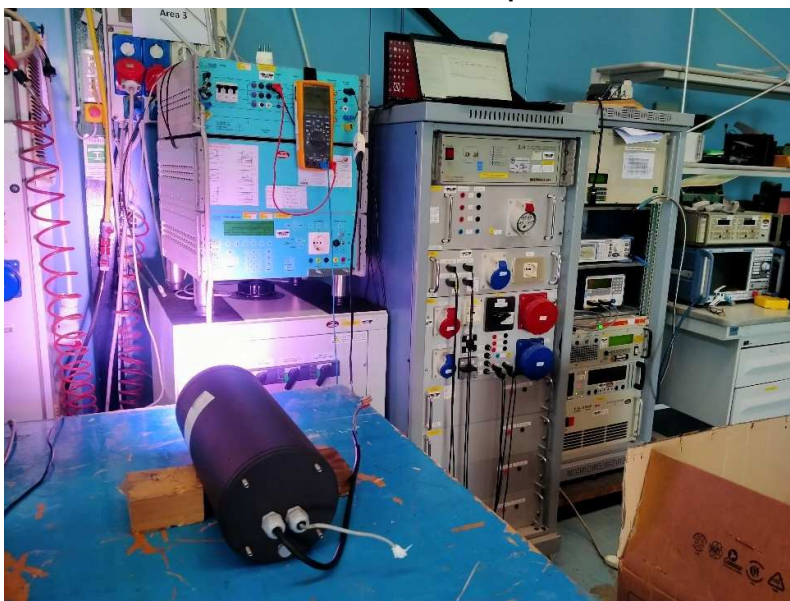
Tested by:	Francesco Casati	
Test date:	2021-07-21	
Test location (stand):	EMC Lab	
Ambient temperature:	28 °C	
Relative humidity:	47 %	
Atmospheric pressure:	993 mbar	
Applied test level:	<input checked="" type="checkbox"/>	0 % during 1/2 cycle
	<input type="checkbox"/>	0 % during 1 cycle
	<input type="checkbox"/>	40 % during 10/12 cycles (50/60 Hz)
	<input type="checkbox"/>	70 % during 25/30 cycles (50/60 Hz)
	<input type="checkbox"/>	80 % during 250/300 cycles (50/60 Hz)
	<input type="checkbox"/>	0 % during 250/300 cycles (50/60 Hz)
	<input checked="" type="checkbox"/>	Other: 70 % during 10 cycle
Repetition rate:	10 s	
Number of dips or interruptions:	3	
Performance criterion:	C; B	
Used mains voltage/frequency:	230 V; 50 Hz	
Supplementary information:	---	

**Photo of test setup:**

**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**





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**Table: Test results for Nebula L ST - sample 1**

$U_N$ [V]	Frequency [Hz]	Test Level [% of $U_N$ ]	Phase angle [°]	Duration [Cycles]	Operating mode	Coupling	Observations
230	50	70	0°	10	1	N-L	A1
230	50	0	0°	0.5	1	N-L	B1
230	50	0	180°	0.5	1	N-L	B1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test

B1: Pass. Temporary switching off during the event. EUT returns to initial condition after test.

**Table: Test results for Nebula L RGBW - sample 2**

$U_N$ [V]	Frequency [Hz]	Test Level [% of $U_N$ ]	Phase angle [°]	Duration [Cycles]	Operating mode	Coupling	Observations
230	50	70	0°	10	1	N-L	A1
230	50	0	0°	0.5	1	N-L	B1
230	50	0	180°	0.5	1	N-L	B1

Supplementary information:

A1: Pass. No observed response / malfunction from EUT during and after the test

B1: Pass. Temporary switching off during the event. EUT returns to initial condition after test.



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## 7 List of test equipment

Equipment used					
Equipment	Type	Inventory number	Manufacturer	Last calibration date	Calibration due date
<b>Test Stand: Conducted emission</b>					
RF CABLES	LMR-240	175758	TIMES MICROWAVE SYSTEMS	2021-02-28	2022-02-28
Line Impedance Stabilization Network 3PH32A	ENV432	154695	Rohde & Schwarz	2021-02-28	2022-02-28
EMI TEST RECEIVER	ESR7	204729	Rohde & Schwarz	2021-01-08	2022-01-28
Software - EMC	BAT-EMC	156535	Nexio Technologies	-	-
<b>Test Stand: Radiated emission (magnetic field)</b>					
Software - EMC	BAT-EMC	156535	Nexio Technologies	-	-
EMI TEST RECEIVER	ESR7	204729	Rohde & Schwarz	2021-01-08	2022-01-28
LARGE LOOP ANTENNA (B)	RF300	51020	LAPLACE INSTRUMENTS	2021-04-16	2022-04-28
LARGE LOOP ANTENNA (C)	RF300	51029	LAPLACE INSTRUMENTS	2021-04-16	2022-04-28
LARGE LOOP ANTENNA (A)	RF300	51021	LAPLACE INSTRUMENTS	2021-04-16	2022-04-28
<b>Test Stand: Radiated emission (electric field)</b>					
EMI TEST RECEIVER	ESW26	207263	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-01-26	2022-01-28
6dB Attenuator 0-18GHz precision type N	DGA9552N	135819	Schwarzbeck Mess-Elektronik OHG	2021-04-28	2022-04-28
N-precision jack (female) to N-precision jack (female)	34_N-50-0-51/193_NE	175757	Huber+Suhner	-	-
N-N Cable 18 GHz 3m	SUCOFLEX_126_E	175756	Huber+Suhner	2021-04-26	2022-04-28
N-N Cable 18 GHz 12m	SUCOFLEX_126_E	175755	Huber+Suhner	2021-02-26	2022-02-28
TRILOG Broadband Antenna 25MHz - 2 GHz	VULB 9168	135822	Schwarzbeck Mess - Elektronik	2020-04-21	2022-04-28
NSA Normalized Site Attenuation (CISPR16-1-4)	EAC54101	154714	PMM FRANKONIA EMERSON & CUMING	2021-05-28	2023-05-28
Software - EMC	BAT-EMC	156535	Nexio Technologies	-	-



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Test Stand: Harmonic current emission					
DIGITAL LOW FREQUENCY EMISSION ANALYZER	B10	68332	BOCONSULT	2021-03-26	2022-03-28
Software - EMC	SPS-EMC	156546	Spitzenberger & Spies	-	-
Test Stand: Electrostatic discharge					
Resistance Box 470 kOhm for ESD Test	R470k	124389	UL International Italia	2020-12-23	2021-12-28
Resistance Box 470 kOhm for ESD Test	R470k	124388	UL International Italia	2020-12-23	2021-12-28
GROUND REFERENCE PLANE	EN AW-1050A	80047	COM-MET	-	-
Resistance Box 470 kOhm for ESD Test	R470k	124390	UL International Italia	2020-12-23	2021-12-28
VERTICAL COUPLING PLANE 500x500x3 mm	None	135137	ER.CO.L.FER	-	-
ESD GENERATOR	ESD 30N	89434	EM Test (Ametek)	2021-05-26	2022-05-28
Insulating Foil for ESD testing IEC 61000-4-2	Insulating Foil	196357	ESD Guns	-	-
ESD TABLE	None	77109	None	-	-
Resistance Box 470 kOhm for ESD Test	R470k	124387	UL International Italia	2020-12-23	2021-12-28



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<b>Test Stand: Radiated, radio-frequency electromagnetic field</b>					
RF and Microwave Signal Generator	SMB100A	135881	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-02-28	2022-02-28
EMC CAMERA SYSTEM	IMAGE 200	71914	Teseq (An Ametek Company)	-	-
LASER POWERED FIELD PROBE	FL7006	76775	Amplifier Research	2021-05-28	2022-05-28
Laser Probe Interface	FI7000	76776	Amplifier Research	-	-
Software - EMC	BAT-EMC	156535	Nexio Technologies	-	-
Switching Unit	GTS4440	51048	NOVOTRONIK	-	-
Directional Coupler	C5982-5P	51045	WERLATONE	2021-02-28	2022-02-28
ULTRA-BROADBAND ANTENNA	BTA-M	51051	FRANKONIA EMV	-	-
RF-POWER AMPLIFIER	FLH-200B	51049	FRANKONIA EMV	-	-
THERMAL POWER SENSOR (A)	NRV-Z51	51039	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-02-24	2022-02-28
THERMAL POWER SENSOR (B)	NRV-Z51	51038	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-02-24	2022-02-28
Power Meter	NRVD	51035	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-03-02	2022-03-28
UFA Uniformity Field Area (IEC61000-4-3)	UFA	154713	UL International Italia	2021-05-28	2022-05-28
<b>Test Stand: Electric fast transient/burst</b>					
EMC Test System	NSG 3060	78501	Teseq (An Ametek Company)	-	-
Electrical fast transient/burst generator module	FTM 3425	78504	Teseq (An Ametek Company)	2020-09-28	2021-09-28
GROUND REFERENCE PLANE	EN AW-1050A	80047	COM-MET	-	-
Automated 3-phase Coupling/Decoupling Networks	CDN 3063-C32	78506	Teseq (An Ametek Company)	-	-
Software - EMC	WIN 3000	156548	Teseq (An Ametek Company)	-	-





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Test Stand: Surges					
Combination wave surge generator module	CWM 3650	78502	Teseq (An Ametek Company)	2020-09-28	2021-09-28
Software - EMC	WIN 3000	156548	Teseq (An Ametek Company)	-	-
Automated 3-phase Coupling/Decoupling Networks	CDN 3063-C32	78506	Teseq (An Ametek Company)	-	-
EMC Test System	NSG 3060	78501	Teseq (An Ametek Company)	-	-
Test Stand: Conducted disturbances, induced by radio-frequency fields					
RF AMPLIFIER	75A250AM1	71482	Amplifier Research	-	-
6dB Fixed Attenuator, N-F N-F	PE7124-6	140567	PASTERNAK ENTERPRISES	2020-10-28	2021-10-28
COUPLING AND DECOUPLING NETWORK	CDN-M2N/32A	63549	EM Test (Ametek)	2021-07-05	2022-07-28
Directional Coupler	C5091-10	53280	WERLATONE	2021-02-28	2022-02-28
Software - EMC	BAT-EMC	156535	Nexio Technologies	-	-
Power Sensor	NRP-Z92	135576	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-04-26	2022-04-30
GROUND REFERENCE PLANE	EN AW-1050A	80047	COM-MET	-	-
Signal Generator	SMT 06	51036	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-05-04	2022-05-28
Test Stand: Power frequency magnetic fields					
DUMMY LOAD	DL 1000V50A	80484	SICUR CONTROL	-	-
DIGITAL CHRONOMETER	STOPCLOCK 5500	80409	Quantum Design	2021-02-26	2022-02-28
TRUE-RMS DIGITAL MULTIMETER	289	169495	Fluke Corporation	2021-04-24	2022-04-28
TEST POWER SUPPLY	TPS/T/18K 54S	37619	Elettrotest S.p.A.	2020-06-09	2023-06-28
HELMHOLTZ COILS	HSS 5218	77940	Schwarzbeck Mess-Elektronik OHG	2021-03-28	2022-03-28
Test Stand: Voltage dips and short interruptions					
TEST POWER SUPPLY	TPS/T/18K 54S	37619	Elettrotest S.p.A.	2020-06-09	2023-06-28
INTERRUPTION GENERATOR	PFS32	57949	EMC PARTNER	2021-05-28	2022-05-28
Variable Autotransformer	V 40 NC/4	85337	BELOTTI VARIATORI	-	-





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Test Stand: Auxiliary equipment					
Power Supply	None	83094	BELOTTI VARIATORI	-	-
DIGITAL OSCILLOSCOPE	HMO1024	79097	Rohde & Schwarz (Koeln) GmbH & Co. KG	2021-02-03	2022-02-28
MAIN SUPPLY VARIAC	T40NC-6	80699	BELOTTI VARIATORI	-	-
Power Frequency Converter AC/AC	FVC 520- 150K BF Ver. 1.0	70835	ZENONE ELETTRONICA	-	-
CLIMATIC CENTRAL UNIT	iBTHX-W	70611	Omega Engineering Inc.	2021-04-21	2022-04-28
CLIMATIC CENTRAL UNIT	iBTHX-W	70614	Omega Engineering Inc.	2021-04-21	2022-04-28
TAPE-MEASURE	3 METERS	37617	ORECA	2021-05-25	2024-05-28
TEST POWER SUPPLY	TPS/T/18K 54S	37619	Elettrotest S.p.A.	2020-06-09	2023-06-28
DIFFERENTIAL PROBE	SI-9010A	88343	TESTEC	2021-02-04	2022-02-28
TRUE-RMS DIGITAL MULTIMETER	289	169495	Fluke Corporation	2021-04-24	2022-04-28



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## 8 Measurement instrumentation uncertainties

Uncertainties of radio disturbance measurements:		
Measurement	U <sub>lab</sub>	U <sub>cispr</sub>
Conducted disturbance at mains port using AMN (9 kHz to 150 kHz)	3.99 dB	3.8 dB
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.63 dB	3.4 dB
Conducted disturbance at mains port using voltage probe (9 kHz to 30 MHz)	3.12 dB	2.9 dB
Conducted disturbance at telecommunication port using AAN (150 kHz to 30 MHz)	n.c.	5.0 dB
Conducted disturbance at telecommunication port using CVP (150 kHz to 30 MHz)	n.c.	3.9 dB
Conducted disturbance at telecommunication port using CP (150 kHz to 30 MHz)	n.c.	2.9 dB
Disturbance power (30 MHz to 300 MHz)	4.41 dB	4.5 dB
Magnetic field with 0.6 m loop antenna	3.56 dB	n.c.
Magnetic field induced current	5.22 dB	n.c.
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.43 dB	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.74 dB	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.83 dB	5.5 dB
Conducted disturbance at mains port using CDNE (30 MHz to 300 MHz)	3.95 dB	3.8 dB
n.c.: not calculated		
Values calculated according to CISPR 16-4-2:2011 + A1:2014 + A2:2018.		
Uncertainties of harmonic currents measurements:		
Measurement	U <sub>lab</sub>	
Voltage RMS	± 1.5 % rdg	
Current RMS (≤ 5 A)	± 1.5 % rdg	
Current RMS (> 5 A)	± 2.5 % rdg	
Active Power (≤ 3 kW)	± 3.0 % rdg	
Active Power (> 3 kW)	± 5.0 % rdg	
Voltage Harmonics (< 1 % fundamental)	± 0.5 % fund	
Voltage Harmonics (≥ 1 % fundamental)	± 5.0 % rdg	
Current Harmonics (< 3 % fundamental)	± 0.15 % fund	
Current Harmonics (≥ 3 % fundamental)	± 5.0 % rdg	
Uncertainties of immunity measurements:		
Measurement	U <sub>lab</sub>	
Radiated, radio-frequency, electromagnetic field immunity test (F.U. deviation not included)	± 2.87 dB	
Immunity to conducted disturbances, induced by radio-frequency fields (CDN)	± 1.23 dB	
Immunity to conducted disturbances, induced by radio-frequency fields (EM-clamp)	± 3.14 dB	
All instruments used for other immunity tests are calibrated and are within the specifications required by the basic standards (IEC 61000-4-X).		

Values expressed as expanded uncertainty with coverage factor  $k = 2$ , that yields approximately a 95 % level of confidence for the near-normal distribution typical of most measurement results.



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## 9 Critical components

Model : Nebula L ST			
Object	Manufacturer/ Trademark	Type/Model	Technical data
Led driver	Signify / PHILIPS Lighting	Xi LP 75W 0.5-1.5A S1 230 V C133 sXt	Input: 220-240 V; ~ 50/60 Hz Pin= 84 W Led Output voltage = 25-75 Vdc; Pout= 75 W
Surge protector	Vossloh Schwabe Lighting Solution	SPC3/230/10K/i	Nominal voltage = UN 100- 277 V AC 50/60 Hz Combined impulse = UOC 10 kV Highest continuous voltage = UC 305 V AC
Led chip	LUMILEDS	LUXEON	COB 1216 and 1211

Model : NEBULA L RGBW			
Object	Manufacturer/ Trademark	Type/Model	Technical data
Led driver	eldoLED	POWERdrive50S- M4Z0X	Input voltage = 120 - 277 VAC Led Output voltage = 15-55V Led Output current = 150-1400mA Led Output power = 50 W
Surge protector	Vossloh Schwabe Lighting Solution	SPC230/10K/i-EQUI	Nominal voltage = UN 100- 277 V / 50-60 Hz Combined impulse = UOC 10 kV Highest continuous voltage = UC 305V AC
Led PCB board	NERI	H1302 PCB 0006.119.025 LED 9596.986.033 LED CREE RGBW	Cree XM-L 6x for L model

## 10 Photos of EUT

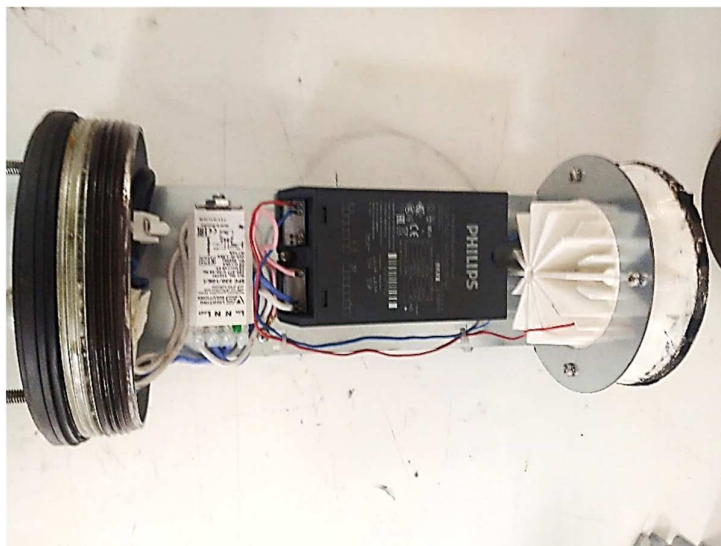
**Nebula L ST - Sample 1**



**Nebula L RGBW - Sample 2**



**Nebula L ST (Sample1) - intenal**

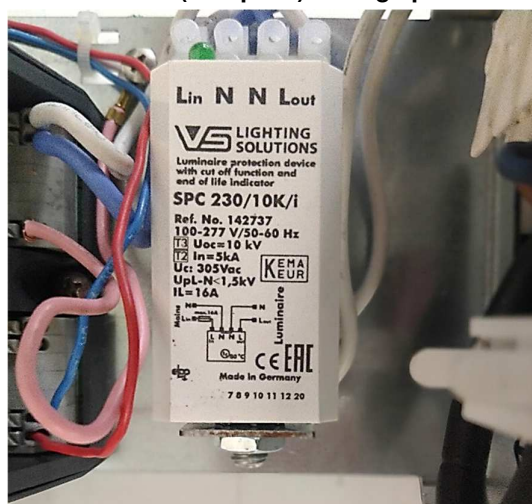


### Nebula L ST (Sample 1) – LED driver

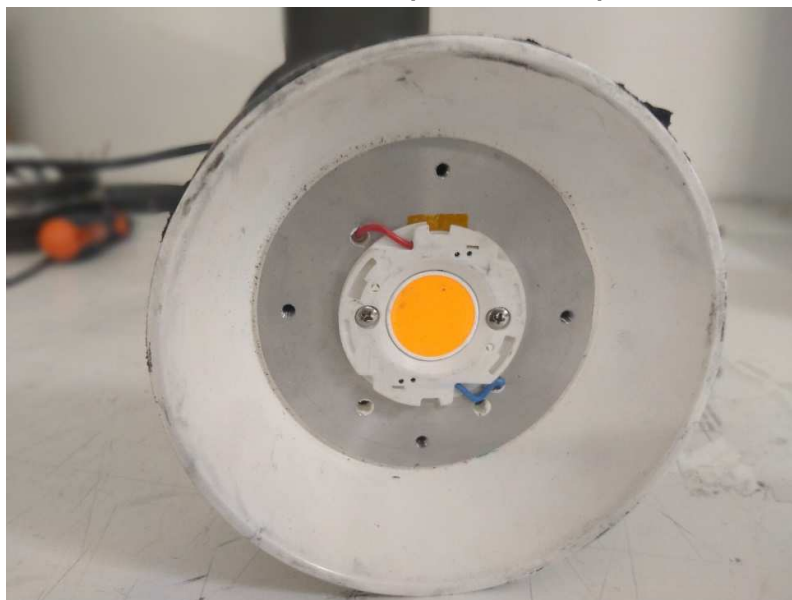




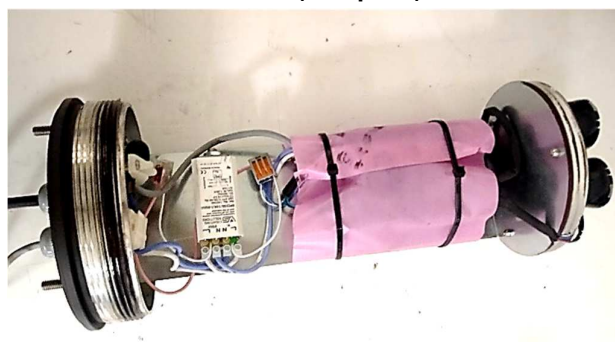
**Nebula L ST (Sample 1) – Surge protector**



**Nebula L ST (Sample 1) – LED chip**



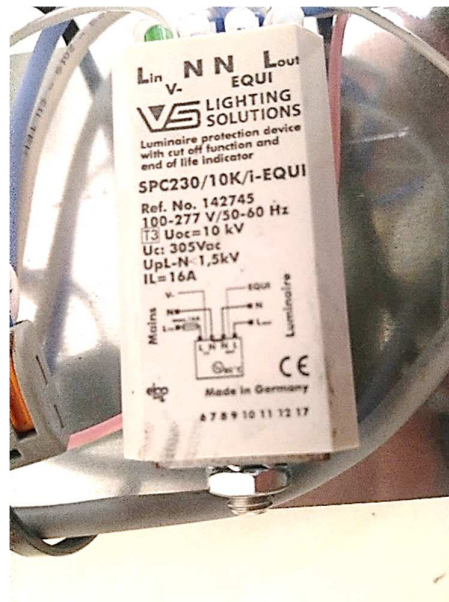
**Nebula L RGBW (Sample 2) - internal**



### Nebula L RGBW – Led driver

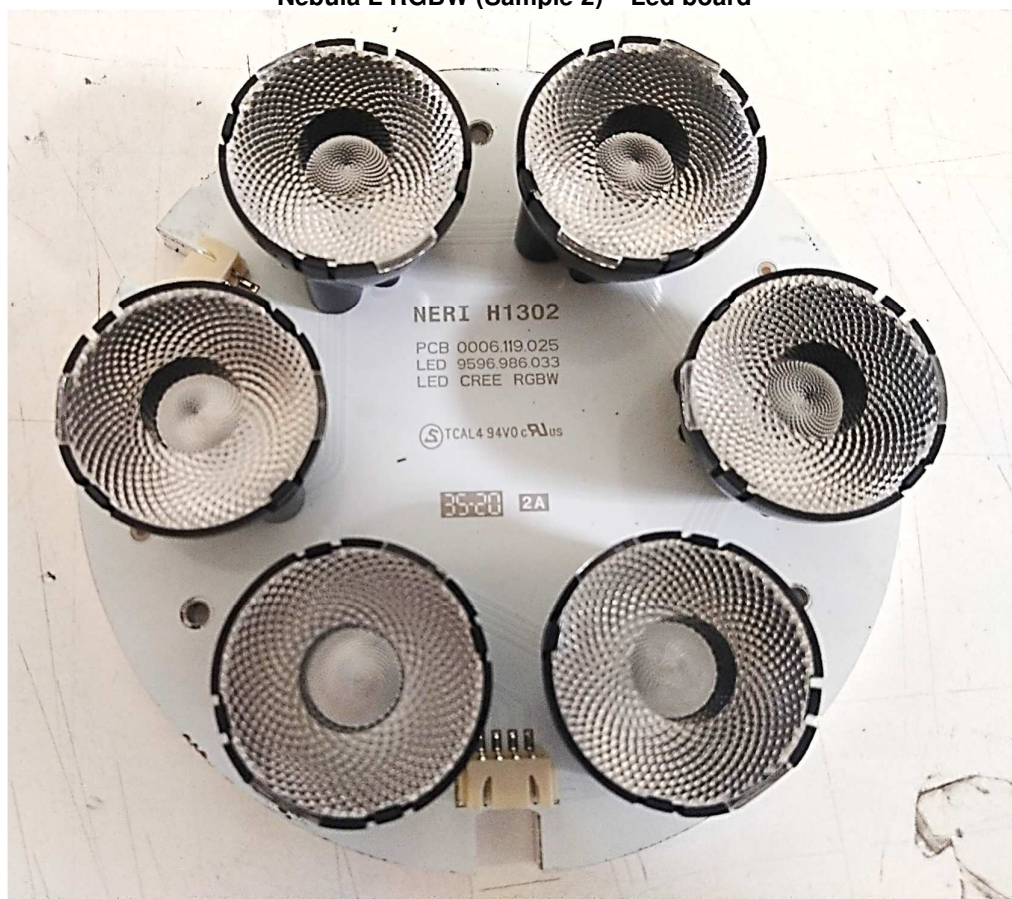


### Nebula L RGBW - Surge protector

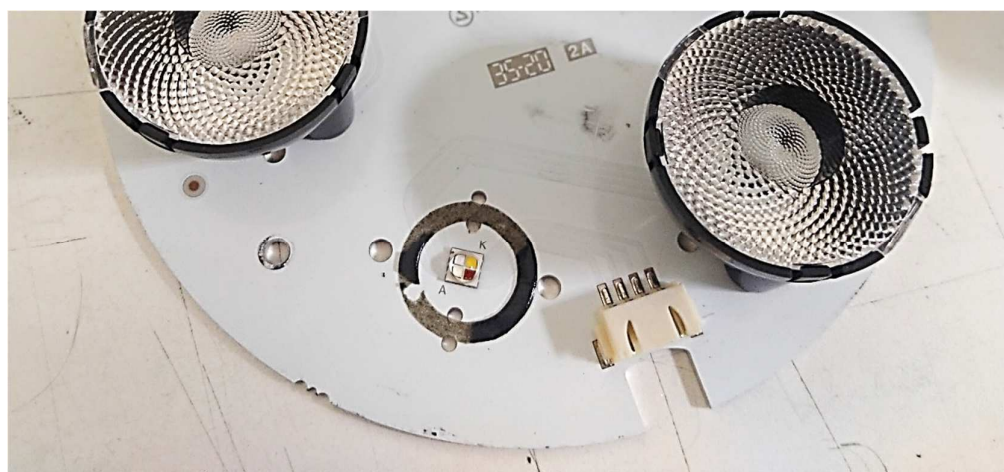




**Nebula L RGBW (Sample 2) – Led board**



**Nebula L RGBW (Sample 2) – Led board**



**< END OF TEST REPORT >**



## **ATTACHMENT: Product Identity Declaration / Model Variants**

*(section excluded from Accredia /ILAC regulations)*

The tested model NEBULA L ST (street optics) is representative of the following models:

- Nebula L PR (beam optics; number of led 1 ; 220-240 V~ 50/60 Hz 44W)
- Nebula L A (street optics ; amber source ; number of led 1 ; 220-240 V~ 50/60 Hz 44W)

Differences don't affect EMC tests, so no additional testing is needed on the model variants.

The tested model NEBULA L RGBW (6 x LED source) is representative of the following model:

- NEBULA S RGBW ( smaller dimension, 3 x LED source ; 220-240 V~ 50/60 Hz 44W )

Differences don't affect EMC tests, so no additional testing is needed on the model variants.

**< END OF ATTACHMENT >**